OCTOBER, 1951
Vol. 7---No. 5

Lubrication ENGINEERING

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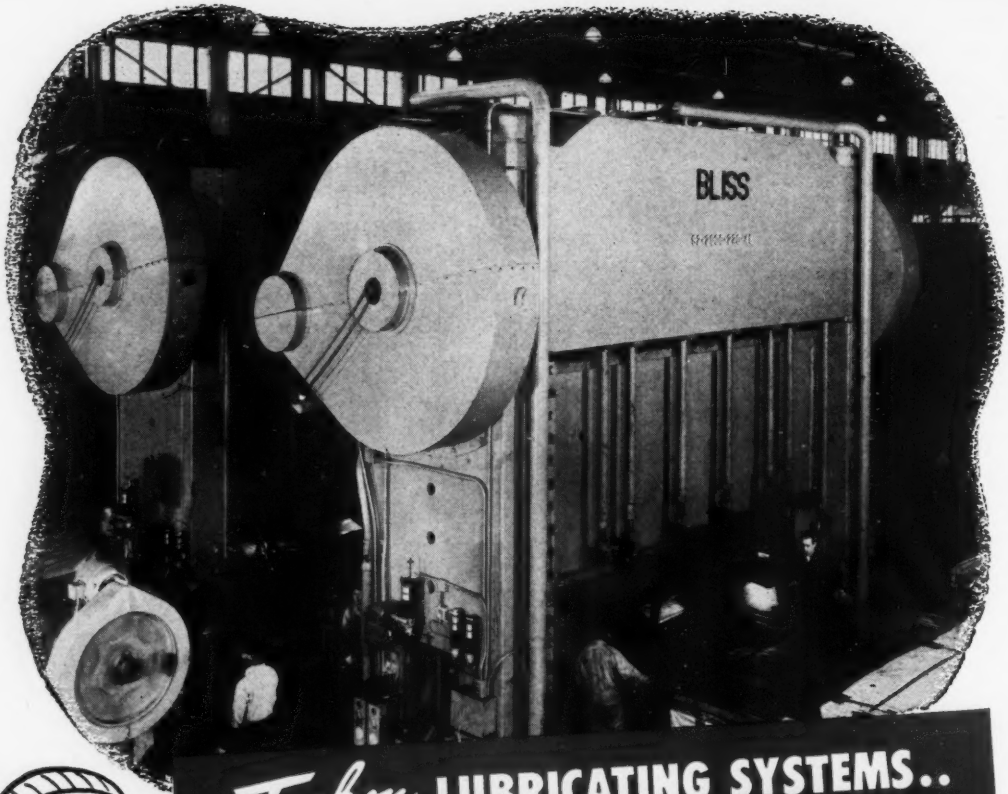
JOURNAL OF THE AMERICAN SOCIETY OF LUBRICATION ENGINEERS



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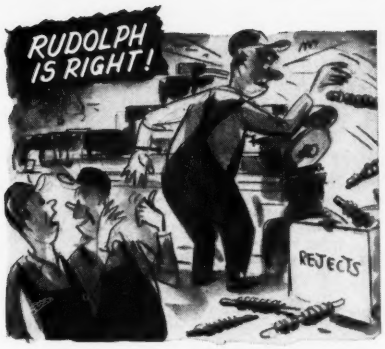

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Lubrication ENGINEERING

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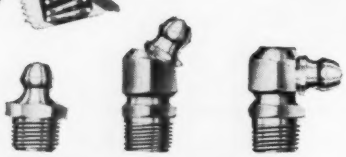

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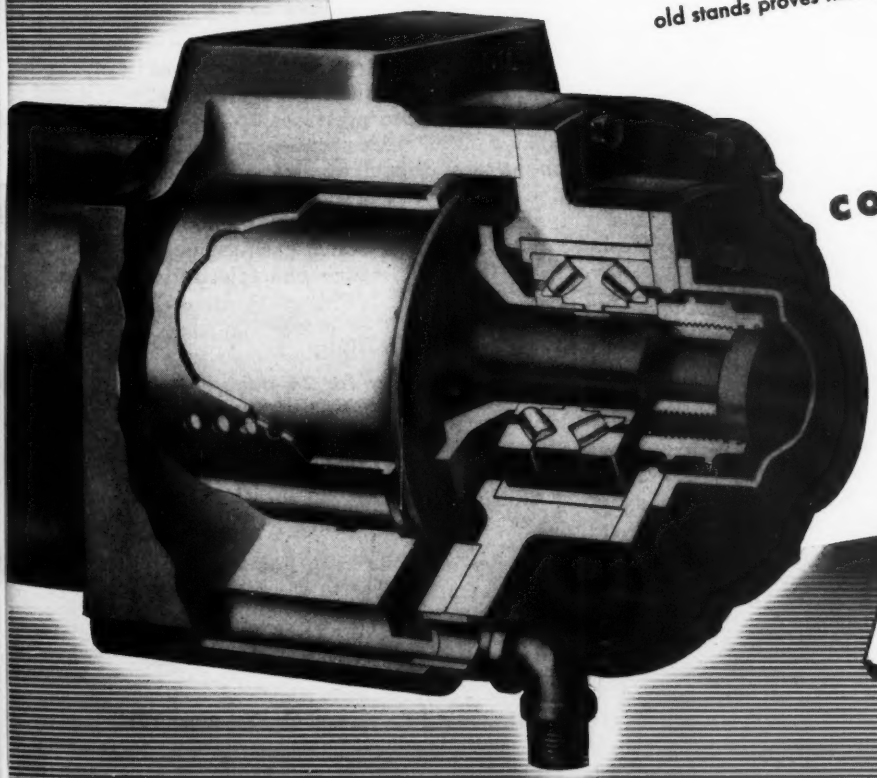

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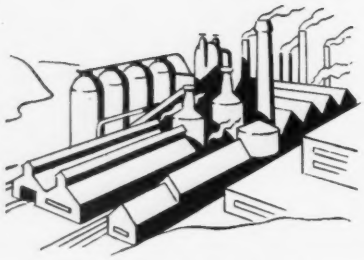

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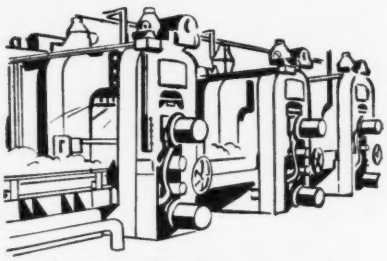
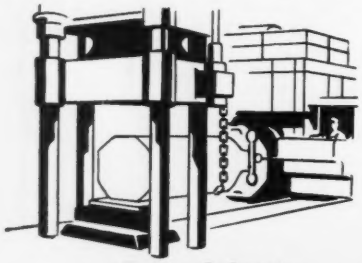


Hot Strip, Cold Reduction and Temper Pass Mills



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ISN'T GOOD ENOUGH . . .

SPECIFY LEADOLENE* Klingfast

The "I.P."* LUBRICANT

On the really tough jobs in the steel industry, the answer to vastly reduced lubricating costs and extended equipment life is *Leadolene Klingfast.* Capable of withstanding pressures up to 50,000 p.s.i., this lead-base lubricant with its "indestructible pH-ilm" has proved itself repeatedly on the most difficult applications.

For efficient lubrication in the presence of water . . . for extreme adhesiveness to steel under high heat conditions . . . for unexcelled abrasion and corrosion-resistance . . . for actual cash savings up to 400 per cent—investigate the performance characteristics of *Leadolene Klingfast.*

CHECK THESE 9 IMPORTANT FACTS:

1. **EXTREME PRESSURE pH-ilm STRENGTH** of 50,000 lbs. per square inch minimum by "Timken" testing machine.
2. **ADHESIVENESS** in which affinity for steel and other metals develops maximum adhesion and prevents drippage or creeping. Retains a flexible coating in nature.
3. **WATER REPELLENCE** which retards washing off, creates a lubricating pH-ilm under moisture or water conditions.
4. **CORROSION PREVENTION** is an excellent protective coating in that it will not etch or corrode metals. Is never acidic.
5. **COMPOUNDED STABILITY**—Will not bleed or change physical condition within range of higher than usual temperatures for this type of lubricant.
6. **LOW TEMPERATURE FACTORS**—While having a solidifying action by decreased temperature as low as —40 F., it does not harden, crack or decrease in adhesion. The flexible coating withstands distortion of the application.
7. **ABRASIVE RESISTANCE**—Extremely high for a lubricant. Does not wipe off nor will be removed in handling by workmen's hands or gloves. Is extremely repellent to adhesion of scale, metallics and other forms of dusts or contamination.
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9. Klingfast can be removed by ordinary solvents such as kerosene, gasolene, naphtha, carbontetrachloride and similar substances but is highly impervious to lubricating oils and greases.

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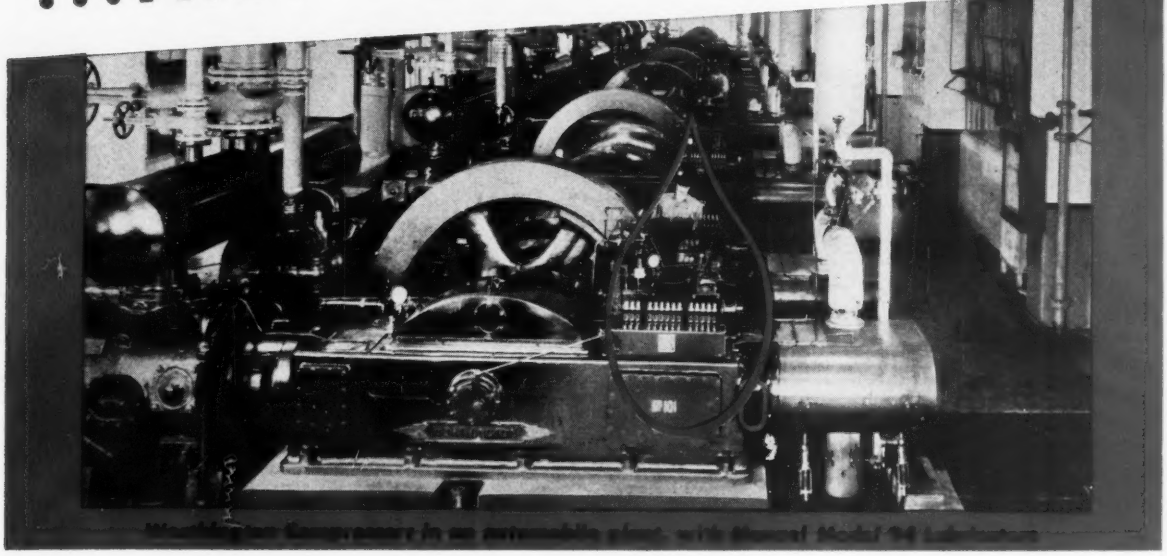
Manzel FORCE FEED LUBRICATORS

...THEY NEVER FORGET



Why it Pays to Select Manzel Lubricators

THEY LENGTHEN THE LIFE OF MACHINERY
Perfectly engineered lubrication adds years of trouble free service.

THEY REDUCE "DOWN TIME"
Machinery is lubricated while in operation.

THEY CORRECTLY LUBRICATE EACH POINT
Separate pumping units for each point to be lubricated.

THEY PUMP AGAINST HIGH PRESSURES
Models available for pressures up to 20,000 lbs.

THEY CUT OIL CONSUMPTION
Accurate metering of oil saves up to 90%.

MANZEL Lubricators are readily adjusted to supply each wearing point with exactly the amount of oil it needs, and *no more.* Thus they produce an amazing reduction in the amount of oil consumed.

Once set, Manzels require no further attention except to maintain the oil supply in the reservoir.

Manzel Force Feed Lubricators are furnished as standard equipment on many of the leading makes of diesel, gas, and steam engines, compressors, pumps, and other heavy machinery. Or they can be installed on your present equipment. They may be synchronized by ratchet or direct lever drive, or operated by a separate electric motor.

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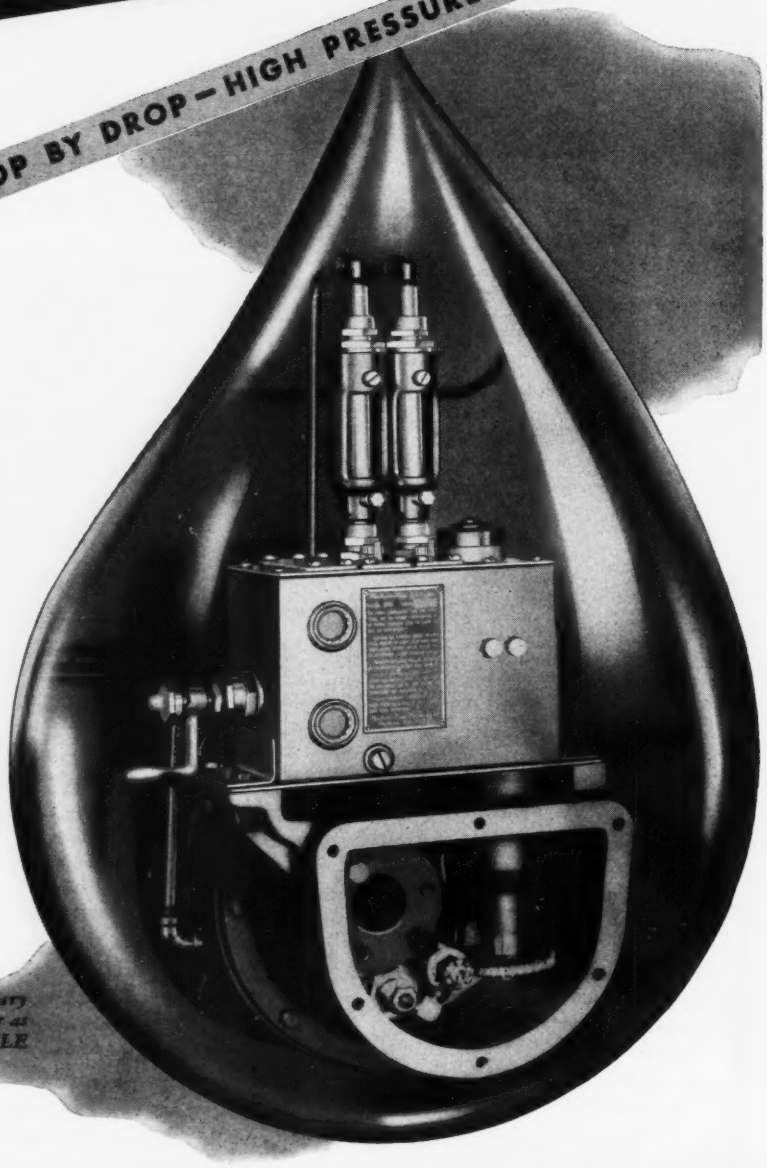
DRIVING SPEED REGULATED TO MACHINE SPEED

MEASURED FEED — DROP BY DROP — HIGH PRESSURE DELIVERY

HERE is a close-up illustration of an actual application of a Bottom Rotary Drive Model SVH Madison-Kipp Lubricator. The operator's responsibility is reduced to a minimum. The machine manufacturer has given his customer a life-time plus value.

Madison-Kipp is the most dependable method of lubrication ever developed and there are models to fit almost every original equipment requirement with automatic drives to fit every application.

Engineering details are, of course, yours for the asking.



Madison-Kipp Bottom Rotary Drive Model SVH Lubricator as applied to Ingersoll-Rand XLE Compressor.

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- *Experienced in* LUBRICATION *Engineering*
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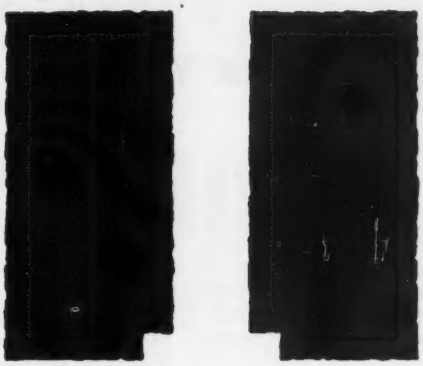
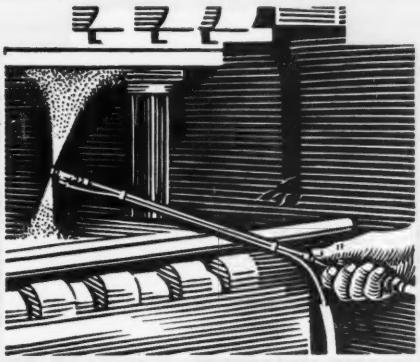


NO SMOKE... NO FUMES in Hot Forging with... "dag" Colloidal Graphite



"Dag" colloidal graphite dispersed in water eliminates smoke and fumes in hot forging operations . . . greatly improves working conditions. The lubricating properties of colloidal graphite are superior, too, giving increased production . . . reduced die wear . . . better finish . . . and usually a saving in steel stock.

The uses of **"dag"** colloidal graphite for hot forging operations are fully explained in a specially prepared article entitled "Forging Die Lubrication". Copies are available without obligation. Write today to Acheson Colloids Corporation, Port Huron, Michigan, for Bulletin #750-12 K.

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DOW CORNING

Silicone Notes

ON LUBRICATION

REFERENCE NO. SL-52

FILE SILICONE LUBRICANTS

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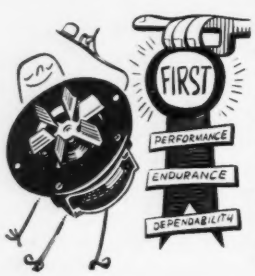
DOW CORNING CORPORATION
Midland, Michigan

DOW CORNING 200 FLUID

Dow Corning 200 Fluid has been tested at various temperatures in contact with oxygen under a pressure of 2000 psi. Presence of silicon dioxide was taken as evidence of oxidation. After 1 hour at 300° F. and after one-half hour at 390° F. there was no evidence of oxidation.

In actual practice, that kind of oxidation resistance is illustrated by the experience of the Breese Burners, Inc., of Santa Fe, New Mexico who manufacture the Drafbooster, a forced-air fan for oil-fired furnaces.

Back in 1940, Breese engineers installed a Drafbooster in a heater designed for use in their own offices. All went well the first season, but by the following season it was noted that the petroleum oil lubricating the fan motor's porous bronze bearings had thickened. The fan refused to run at normal speed; insufficient air was provided for complete combustion. By mid-winter, the Drafbooster had to be replaced.



The same thing happened with the next Drafbooster, and the next, and the next. Then, in November of 1945, they installed a unit lubricated with Dow Corning 200 Fluid. This Drafbooster has been in operation 6 years without replacement, relubrication or cleaning.

Breese engineers recently inspected their office unit and reported only negligible bearing wear. The silicone fluid has not thickened and is still crystal-clear. Dow Corning 200 Fluid satisfies their requirements so completely, they say, that if this silicone fluid suddenly became unavailable, they'd stop making Drafboosters.

DOW CORNING 550 SILICONE OIL

Dow Corning 550 is notable even among silicone fluids for its exceptional heat stability. Stability and oxidation resistance are demonstrated by the fact that it does not gel or decompose to form gums even after heating at 482° F. for 1000 hours in contact with air.

To Flash-O-Graph Corporation, of Long Island City, New York, that kind of oxidation resistance means an annual saving of thousands of dollars in maintenance and repair costs.

The Flash-O-Graph is an animated advertising sign for store windows and counters. The advertiser's message is punched in a black ribbon belt which is driven across the front of a fluorescent lamp by a phonograph-type motor. It is estimated that the belt revolves 31 million times a year.

For appearance's sake, the sign is almost totally enclosed. As a result, considerable heat develops and failure of the motor's sintered-bronze bearings is common. Once, in fact, an entire order of 1000 signs was replaced less than a week after shipment because of bearing failures.

Then, 16 months ago, Flash-O-Graph ran comparative tests between six signs lubricated with the highest grade petroleum oils and six with Dow Corning 550 silicone oil. The best of the petroleum lubricated group lasted only 20 days without relubrication. All six of the silicone lubricated group are still running . . . without relubrication.

About a year ago Flash-O-Graph standardized on Dow Corning 550 silicone oil for the bearings of sign motors. They estimate their service problem has been reduced 99%. Of thousands of silicone lubricated units since put into the field, not one has been returned because of bearing failure.

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From 3 gallons per day to 4 ounces per day!
A leading pump manufacturer* announces this saving after installing Oil-Mist on a single machine.

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From 1 gallon per day to 2½ ounces per day!
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From 100 ounces in 8 hours to 5 ounces in 8 hours!
So reports a prominent tire and rubber company* after installing Oil-Mist on a single sole trimmer.

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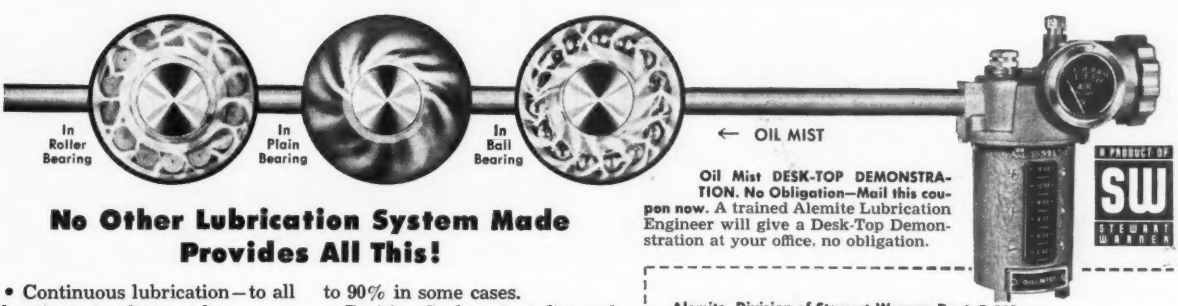
Proved in use by all segments of U. S. Industry—automotive, aircraft, printing, packaging, canning, appliance manufacturers, metal processors and fabricators, food processors of every sort—Alemite Oil-Mist assures new savings, big savings . . . *savings never possible before* in machinery lubrication! Get the proof yourself through a Desk-Top Demonstration. Clip and mail coupon below *today!* *Name on request



No Other Lubrication System Made Provides All This!

- Continuous lubrication—to all bearings simultaneously.
- Automatic control, permitting each individual machine to receive proper lubrication whenever in use.
- Elimination of guesswork. The bearing picks up only as much oil mist as it needs.
- Reduced Oil Consumption—Up to 90% in some cases.
- Positive Seal against dirt and abrasives.
- Reduced Bearing Temperatures.
- Prolonged bearing life—as much as 17½ times.
- Prevention of product spoilage.
- Substantial reduction in the number of oils needed.

Alemite OIL-MIST Lubrication

Oil Mist DESK-TOP DEMONSTRATION. No Obligation—Mail this coupon now. A trained Alemite Lubrication Engineer will give a Desk-Top Demonstration at your office. no obligation.

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☐ Please have your Alemite Lubrication Representative arrange a desk-top demonstration of Oil-Mist. This entails no cost or obligation on my part.

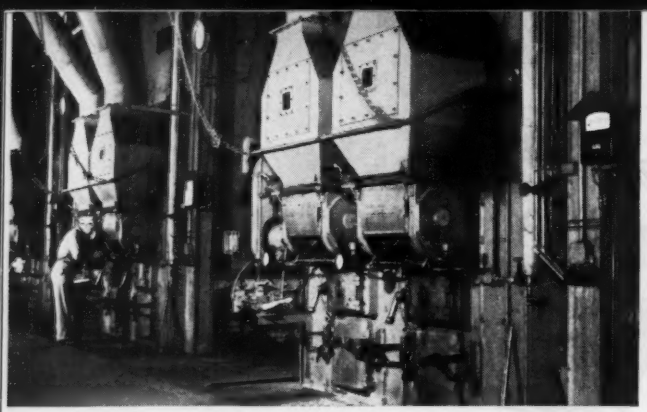
☐ Please send me information about Oil-Mist by mail.

My name .....

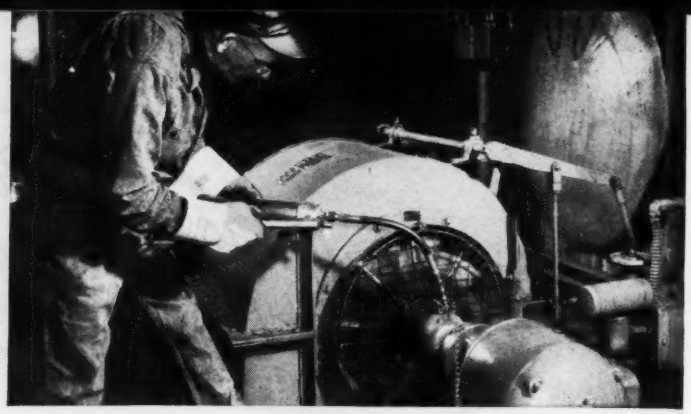
Position .....

Company (leave blank if letterhead attached) .....

.....



TO GENERATE STEAM for manufacturing, Triangle Conduit and Cable uses three 350 hp boilers. Each unit generates 22,500 pounds per hour, 24 hours a day, 5 days a week. *Sun Solnus Oil* lubricates the spreader stoker oil bath, *Sun 844 Grease* the pulley drive, stoker motor and pillow block.



TO CONTROL THE AMOUNT OF AIR entering the fire box, three forced draft fans are kept in constant operation. The motor and fan bearings and the speed reducer motor are lubricated with *Sun 844 Grease*, while the gears and reducers are protected by a *Sun* gear oil.

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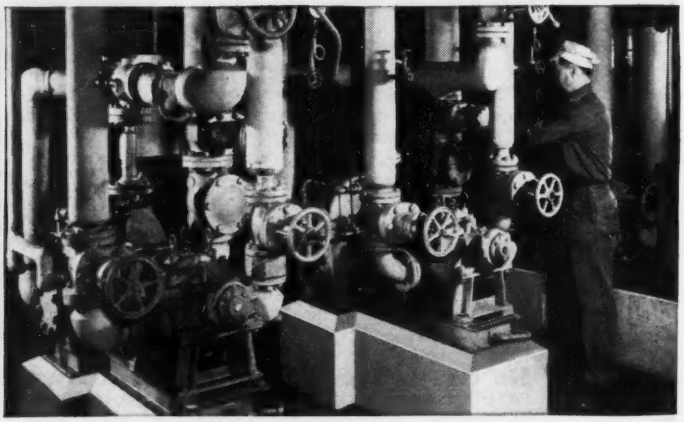
For technical assistance or a copy of the manual "Lubrication of Industrial Machinery," write on your business letterhead to Department LE-10.

TO HELP GET PROPER COMBUSTION in the boilers, three exhaust fans are used. The turbine which drives them turns up 3,600 rpm. The engineer says the lubricant, *Sunvis 951*, looks like new when it is changed to get rid of condensate.



TO FEED WATER TO THE BOILERS, two 3,500 rpm turbine-driven pumps are employed. A motor-driven pump is used in starting up when there is no steam pressure. *Sunvis 951* lubricates the turbines, *Sun 844 Grease* the pump fittings.

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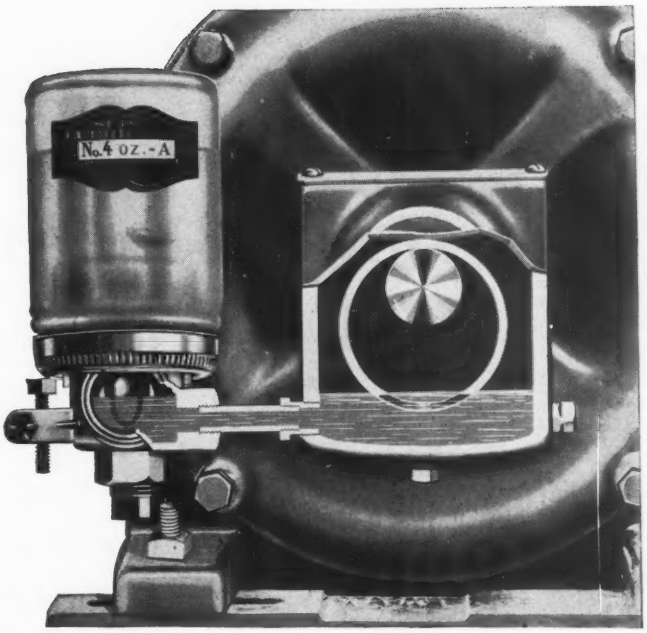

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June 5, 1950	144-4 oz. "
July 17, 1950	144-4 oz. "

*NAME ON REQUEST

NEW JERSEY Manufacturer*

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3-15-49	14-4 oz. "
7-18-49	45-4 oz. "
8-5-49	90-4 oz. "
8-23-49	170-4 oz. "
9-26-49	174-4 oz. "
11-23-49	27-4 oz. "
12-5-49	12-4 oz. "
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9-21-50	82-4 oz. "

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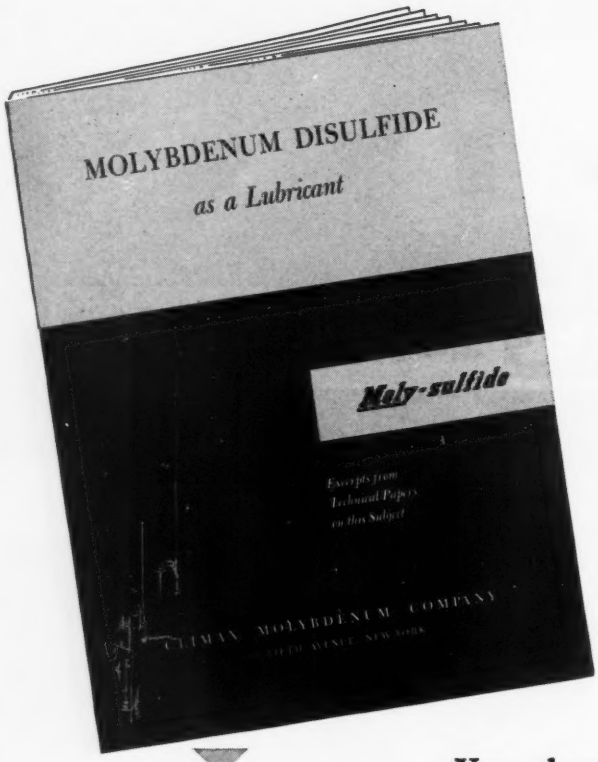

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VICTOR A. RYAN–1893-1951

VICTOR A. RYAN, Director of Research, Crown Cork & Seal Company, Baltimore, Maryland, and ASLE Vice-President at Large, President Elect for 1952, died September 20 after a brief illness. He was recognized as a national authority in paper technology and lubrication.

Mr. Ryan graduated from Drexel Institute of Art, Science and Industry in 1916. After two years of technical work with E. F. Houghton & Company at Philadelphia, he joined Marden, Orth & Hastings, Chicago, as Chief Chemist.

In 1920 he became Research and Technical Director of Irvington Varnish & Insulator Company at Irvington, New Jersey, which position he held for ten years. From 1930 to 1933 he was Director of Research for the Durium Products Company and for the next three years he was in business as a Consulting Chemical Engineer.

Mr. Ryan joined the research staff of the Crown Cork & Seal Company in 1936 as Paper Technologist. In addition to his work with paper he became, in 1939, Chief Lubrication Engineer for the company. In 1940 he was made Director of Research.

Mr. Ryan was an officer in the American Society of Lubrication Engineers, having been Chairman of the Baltimore Section in 1948-1949 and a Director of the National organization from 1949-1951.

Mr. Ryan's contributions to the growth, development and progress of ASLE have been of inestimable value. He has had published numerous articles on the various phases of lubrication and has presented his findings before many groups. His loyalty and devotion to the Society were always uppermost in his thoughts. His death is a tragic loss, not only to his many personal friends, but to the Society as well. The greatest tribute we can pay to the memory of Mr. Ryan is to go forward in the fulfillment of the ideas he had so painstakingly formulated.

Mr. Ryan was an active worker in the American Society for Testing Materials, the American Chemical Society and the Technical Association of the Pulp & Paper Institute. He also held membership in the American Association for the Advancement of Science, the American Society of Plastic Engineers, the American Society of Electrical Engineers and other scientific organizations.

He is survived by his wife, Marie M. Ryan; a daughter, Mrs. Bernard G. Renz; a son, Victor J. Ryan; a sister, Mrs. C. E. Sharp of Chicago; and two brothers, John J. of Philadelphia and Anthony V. of Linden, N. J.

NUMBER 6

OIL LUBRICATION OF MACHINE TOOL SPINDLES*

By G. W. Gleim
Staff Engineer
Esso Standard Oil Company
15 West 51st St.
New York 19, N. Y.

Mr. Gleim graduated from Rensselaer Polytechnic Institute in 1935 with a degree in Mechanical Engineering.
During World War II he served as an officer on the staff of the Chief Engineer, Research Section, Navy Department Bureau of Ordnance, engaged in the development of lubricants and hydraulic fluids.
He has been in the Sales Engineering Division of Esso Standard Oil Company since 1946.

When the word "spindle" is mentioned, the average person thinks immediately of textile machinery. Actually, spindles of various designs are indispensable in the operation of several other types of equipment. An important spindle application outside the textile field is in machine tools.

The oil-lubricated machine tool spindle differs from its textile counterpart in several respects:

1. The textile spindle is usually composed of hardened steel elements operating against cast iron. The bearings of the machine tool spindle are likely to be hardened steel against various types of bronze.

2. The textile spindle normally operates in a vertical position. On a machine tool the spindle will quite often be found in a horizontal position.

3. Loads on the textile spindle tend to remain uniform, or to increase or decrease uniformly. Such loads are quite often due to eccentricity. The machine tool spindle is subjected to variable loading, but this loading is almost never eccentric.

4. 9000 to 10,000 rpm is considered high speed for a textile spindle. The machine tool spindle—in certain applications—may travel as fast as 100,000 rpm.

5. The oil bath is the most commonly used lubrication method for textile spindles. Lubrication methods vary from machine to machine with oil-lubricated machine tool supplies.

Both types of spindles may use anti-friction bearings instead of plain bearings. And, despite their numerous differences, both types can be lubricated with the same type of oil. Of course, it must be realized that some types of machine tool spindles are grease lubricated. However, this discussion will be confined to those lubricated with oil.

Function of the Machine Tool Spindle

The machine tool spindle is expected to provide rotational motion and to resist any other type of motion, even under shock loads. The accuracy of the machine itself is largely dependent upon the operation of the spindle. As a consequence, the typical spindle is a machine member built to extreme accuracy and with very small clearances, yet having sufficient flexibility to permit adjustment in alignment and clearances on the machine. Figure 1, an illustration of a grinder spindle, shows the provisions made for clearance adjustments.

Spindle Oil Viscosity Requirements

The accuracy of the spindle action depends directly upon the lubricating oil film on which the spindle moves. When this fact is understood, the importance of proper choice of oil becomes apparent.

A factor of critical importance in a spindle oil is viscosity. The oil must have a viscosity exactly suited to the design of the spindle and the speed range in which it operates. Too high a viscosity will cause a "drag" on the spindle. Heat develops from internal friction, which causes the metal members to expand, changing the location of the spindle with relation to the other machine members and the work being ma-

*Sponsored by ASLE Technical Committee on Lubrication Economics.

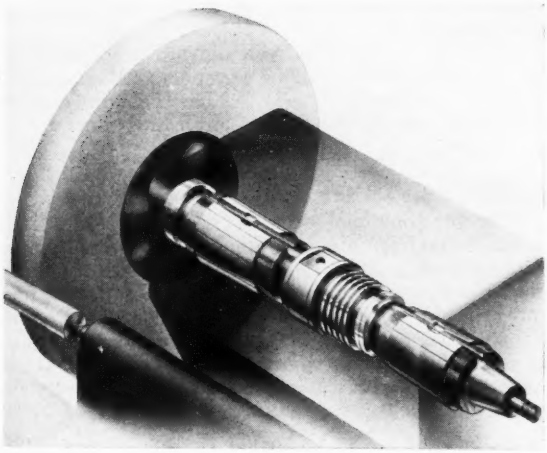

Fig. 1

Wheel spindle for a Norton Grinder. (Norton Co. drawing.)

chined. It is difficult to hold work to desired size under such circumstances.

On the other hand, an oil with too low a viscosity for a given machine will run thin on the spindle bearings. Metal-to-metal contact is likely to develop, and the spindle will wear to the point where the machine no longer functions accurately.

The question of spindle oil viscosity is complicated by the fact that the requirements of various types of machine tools vary widely, even though the machines may be made by the same manufacturer. Figure 2 is a drawing of a spindle for use in surface grinding machines. This spindle has a clearance of only 0.00011 inches on the radius and is lubricated by a constant level reservoir. The manufacturer specifies that the oil for use in this spindle must have a viscosity of 32 to 36 Saybolt Seconds Universal (1.5 to 3 cs.) at 100 F. Yet this manufacturer produces other grinders requiring a spindle oil of 100 SSU (21 cs.) at 100 F.

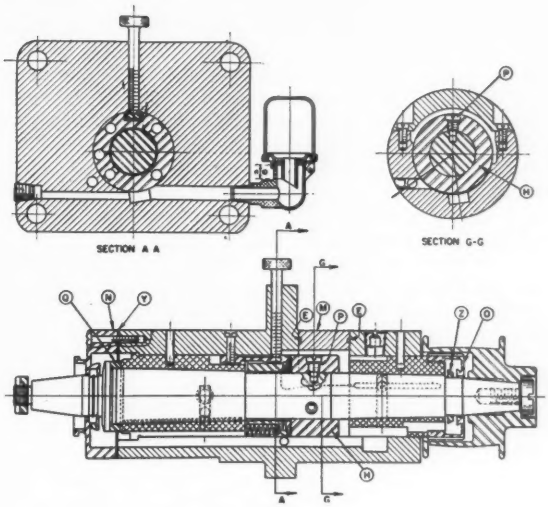

Fig. 2

Plain bearing spindle for Brown & Sharpe No. 2 and 2B Surface Grinding Machine, showing constant level oil reservoir. (Brown & Sharpe Mfg. Co. drawing.)

Variations in spindle oil requirements are, of course, even more prevalent among machine tools of different manufacturers. Some idea of these variations may be found in the following list:

It is obvious, then, that the machine tool operator would do well to follow the machine tool manufacturer's recommendations in selecting the viscosity grade of spindle oils. Fortunately, the petroleum industry supplies quality spindle oils in a wide enough range of viscosities to satisfy all but the most unusual requirements.

Other Spindle Oil Requirements

Clean oil is desirable in any lubricating job, but it is an absolute necessity in machine tool spindles. The

MANUFACTURERS' SPINDLE OIL RECOMMENDATIONS FOR GRINDERS

Grinder Manufacturer	*Viscosity Recommendations SSU at 100 F.*	*Centistokes at 100 F.*
Arter Grinding Machine Company	100-110	21-23
Barber-Colman Company	60, 100-200, or 300*	10, 21-43, or 65
The Blanchard Machine Company	70	13
Brown & Sharp Manufacturing Company	32-36 or 105	1.5-3 or 22
Bryant Chucking Grinder Company	100-105 or 300	21-22 or 65
The Cincinnati Milling Machine Company	100-120	21-25
Ex-Cell-O Corporation	60	10
The Fellows Gear Shaper Company	100**	21**
Jones & Lampson Machine Company	100 or 150	21 or 32
Landis Tool Company	45-65	6-12
Norton Company	50-60	7-10
The Thompson Grinder Company	60 and 300 or 150	10 and 65 or 32
Van Norman Company	50-60 or 150-160	7-10 or 32-34
Van Norman-Fitchburg	50-60	7-10

*All viscosities specified at different temperatures, but converted here to 100 F. for comparison.
**"Light spindle oil" is specified.

importance of cleanliness becomes clearer when you consider the precision with which spindle parts are made and the almost microscopic clearances between these parts. Even the tiniest particles of foreign matter can wreak havoc in this kind of machine element, causing interference between moving parts and serious wear on metal surfaces. To guard against trouble from this source it is suggested that, before a new machine is put to work, its lubrication system be thoroughly flushed with the spindle oil. The oil will wash out dirt and other foreign material and should, of course, be discarded when the cleaning is completed. If a cleaning material other than the spindle oil is used, there is always a chance that a certain amount will remain in the system and contaminate the spindle oil when the machine is put into actual operation. If there are filters in the system, they should be checked to be sure they are in working order. When the machine goes into operation, a definite maintenance schedule should be set up to clean the filters at regular intervals.

All petroleum oils are a prey to oxidation from contact with air. The better oils will resist this oxidation, and oils of the quality necessary for spindle lubrication are further fortified against it by the addition of an oxidation inhibitor. It is essential that a machine tool spindle oil have *all* of this natural and acquired resistance. An oxidized oil produces varnishes that form on the working parts of the spindle, decreasing clearances and preventing accurate spindle action. Sludge, which plugs up the lubricating system and prevents the oil from flowing properly through the spindle, is also a product of oil oxidation.

Another source of contamination is rust. Many machine tool spindles operate in shops where there is a considerable drop in atmospheric temperature at the end of the working day. Under such conditions it is easy for moisture to collect in the lubrication system by condensation from the air over the reservoir. Moisture can also collect from the coolants used on the machine, which are often of the water-and-oil type.

It goes without saying that rusting in any part of the lubrication system should be avoided. The worst thing rust can do, of course, is to form in the spindle itself. Since rusting is the eating away of metal, such action in a spindle can have a calamitous effect on dimensional accuracy. At the very least, rust particles in other parts of the system will be carried by the flow of oil into the spindle, where they are as undersirable as any other type of foreign matter.

Here again the use of a quality spindle oil pays dividends, since most of those available contain effective rust preventive inhibitors.

Earlier in this discussion the statement was made that machine tool spindles are subject to shock loads. Such loads occur when a cut is started on the machine tool—or when the cut is interrupted and then resumed. It is possible that a spindle oil of the proper viscosity under normal running conditions will not stand up under such shock loads, particularly if it is within the lower viscosity range. Normally efficient lubricant films may be ruptured at such times, and dangerous wear can start on metal surfaces of the spindle before the film can re-form.

Shock loads, however, will not affect a spindle oil that contains a mild extreme pressure ("EP") additive. Such oils are available today. The EP additive in no way interferes with the normal lubricating film.

Lubrication Systems

The machine tool operator is not limited to any single method for applying spindle oils. Almost every system known to industry is found on modern machines. Force feeds, constant level reservoirs, mist lubricators, and drip and wick feeds are all common. One highly regarded system is illustrated in Figure 3, which shows an oscillating grinder, having a spindle speed of 45,000 rpm, equipped with a mist lubricator.

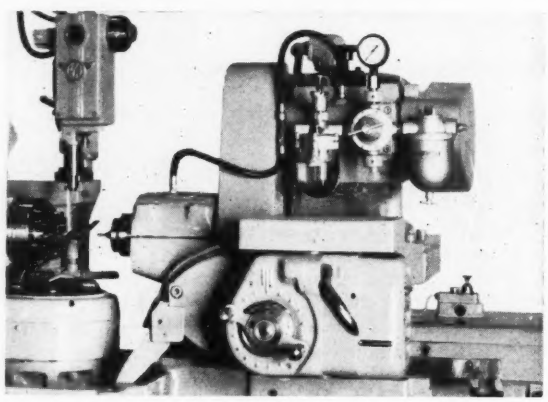

Fig. 3

Grinding head on a Van Norman Oscillating Grinder, having spindle speeds up to 45,000 rpm. Spindle and jack shaft, both mounted on pre-loaded ball bearings, are mist lubricated. (Van Norman Machine Tool Co. photo.)

In Closing . . .

Nowadays the "problem" of choosing the correect machine tool spindle oil is really no problem at all. The most important question — proper oil viscosity — has already been answered by the machine tool manufacturer, and his recommendations should be the only criterion. The other necessary properties of the spindle oil, as we have seen, are:

1. Cleanliness.
2. Oxidation resistance.
3. Rust prevention.
4. EP properties.

Reputable oil refiners are able to supply spindle oils with these properties. Such oils are, of course, premium quality products and cost more than straight mineral oils. However, this added cost becomes a rather insignificant factor when it is viewed in terms of the value of the spindle being lubricated and the accuracy of the work it is expected to do.

SOME PROBLEMS ENCOUNTERED IN THE USE OF SOLUBLE OILS*

By A. W. Lindert
Research Department
Standard Oil Company (Indiana)
Whiting, Ind.

Mr. Lindert received his Bachelor of Chemical Engineering degree at the University of Minnesota in 1931. He continued graduate studies there until 1933—major in Bacteriology, minor in Bio chemistry.
In 1940 Mr. Lindert affiliated with the Standard Oil Company of Indiana as lubricating sales department representative in Montana. In 1943 he transferred to the Sales Technical Service Department as specialist in industrial lubricants, and in 1947 became Group Leader in the Research Department specializing in the research and development of industrial lubricants.
He is a member of ASLE and ACS.

ABSTRACT

The development of bluish-black stains on fine-ground iron surfaces appear to occur according to the following mechanism: (1) Solution or dispersion of iron as ferrous compounds in the soluble oil emulsion; (2) Oxidation of the ferrous compounds to ferric compounds; (3) Flocculation and precipitation of the ferric compounds on freshly ground iron surfaces during the evaporation of water from the emulsion film; (4) Development of ferrous-ferric oxides on the metal surfaces through an oxidation-reduction reaction of the metal with the deposited ferric compounds.
In addition to development of foul odors in emulsions, bacteria appear to be a factor in stain development. Bacteria encountered in these studies belong to the genus Pseudomonas or Achromobacter. Many commercial germicides are inadequate for control of these organisms in soluble oils.

In many metal-working processes and especially in grinding operations it is of prime importance that the work piece be kept cool to maintain dimensional stability, to avoid localized burning, and to prevent undesirable changes in surface-hardness properties. Although water is the cheapest and one of the best coolants available, it has the disadvantage of being a promoter of rusting. "Soluble oils," or more correctly "emulsifiable oils," when dispersed in water, provide moderate rust prevention without impairing the cooling properties of the water. The most common soluble oils are petroleum oils containing sufficient soaps or other surface-active agents to cause the oil to form stable emulsions with water. Although there is a general similarity as to the ingredients used, compositions vary considerably to take care of water-hardness conditions and other factors encountered in service.

In spite of the widespread use of soluble oils, little information is available to explain some of the difficulties encountered. In the light of recent experimental work, the following paragraphs discuss two of the least understood problems—factors that contribute to staining of ferrous metals, and bacteriological problems, with particular reference to odor development and the role of bacteria in the staining problem.

Staining of Ferrous Metals

In the grinding of ferrous metals to a smooth finish, bluish-black spots frequently develop on the polished surface as the moisture evaporates from the adhering emulsion film. The spots, or stains, appear to be embedded in the metal itself and are not removable by water, organic solvents or other cleaners. In a practical sense, they can only be removed by further machining of the metal. Some soluble-oil users have attributed the development of blue-black stains to water hardness, while others have blamed the difficulty on some peculiarity of the soluble oil. The present work indicates that other factors have a greater effect in aggravating stain formation.

Early in the experimental work it was suspected that stain development in the presence of soluble-oil emulsions was at least partially related to corrosion of iron chips normally in contact with the emulsion.

Experimental

Three techniques were employed to study changes in emulsions of various soluble oils in waters of different hardness in contact with iron chips. Such factors as rate of iron corrosion, pH change, and staining tendency were observed in all cases.

Early studies involved static tests wherein five cubic centimeters of a 50:1 water-oil emulsion were introduced into a test tube containing 2.5 grams of reduced-iron powder or fine chips of ordinary commercial cast iron. After addition of the emulsion, the test tube was lightly agitated to ensure wetting of the iron. Complete displacement of entrained air was obtained by applying vacuum to the test tube. The tube was then stoppered and stored at room temperature in a rack along with other test samples. At daily intervals the tubes were visually examined, and small samples of emulsion were withdrawn with a micropipette. The samples were checked for approximate pH by depositing a droplet on a strip of indicator paper. Another droplet was placed on a freshly polished panel of SAE 1020 steel and examined immediately, and again at intervals of fifteen

*Paper presented at 6th Annual Meeting, ASLE, Philadelphia, Pa., April 17, 1951.

minutes to one hour, to determine whether a stain developed on the metal.

Similar static tests were run on emulsions containing a variety of possible corrosion inhibitors. These included phosphates and carbonates, and petroleum sulfonates.

The second test method employed agitation to increase the rate of corrosion of the iron chips and to permit wide variations in the weight ratios of metal chips to soluble-oil emulsion. Quantities of iron to give iron-oil ratios of 25, 50, or 100 to 1 were weighed into 125-cc Erlenmeyer flasks and 15-cc of 50:1 water-oil emulsion were added by pipette. The mouth of the flask was loosely closed by a wad of cotton and the flask was set upright in the holder of a mechanical shaker adjusted for approximately 180 cycles per minute with a stroke amplitude of about one inch. Agitation of the samples was interrupted momentarily at intervals of 1 to 8 hours to withdraw emulsion samples for pH tests, determination of ferrous and ferric iron, and stain tests.

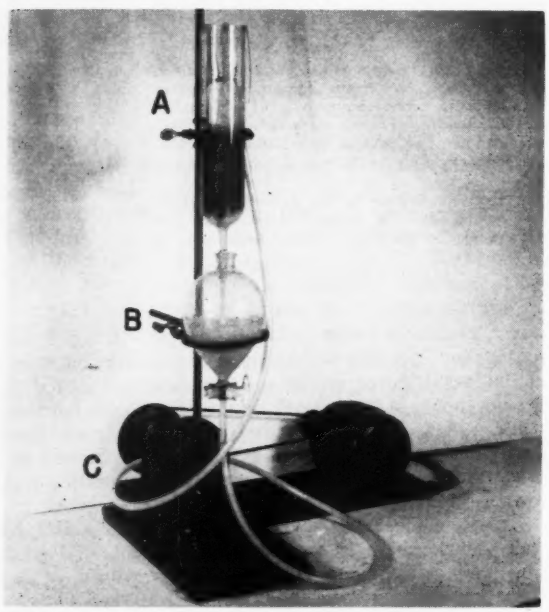

Fig. 1

Recycle Test Apparatus.

The third test method provided for the continuous recycling of soluble-oil emulsions over clean cast-iron chips. The apparatus for this test is shown in Figure 1: 400 grams of 4-8 mesh, oil-free, cast-iron chips were introduced into the cylindrical glass tower A, which contains a fine-mesh stainless-steel screen at the bottom to prevent excessive loss of iron chips into the emulsion reservoir B. 600-cc of 50:1 water-oil emulsion were poured into the tower, and the circulating pump C was started. Delivery of emulsion to the pump was controlled by suitable adjustment of the stopcock on the bottom of reservoir B. Emulsion delivered by the pump to Tower A was distributed over a perforated, stainless-steel baffle to avoid channeling of the emulsion as it flowed through the iron chips. At intervals of two hours, a 20-cc sample of emulsion was collected from the delivery tube at the top of tower A. Circulation was then stopped, the chips in the tower were replaced with a fresh batch, and circulation was renewed for another two-hour period. Emulsion samples were checked for oil content (to determine oil-water ratio), pH, and stain tendencies.

Results and Discussion

Each of the three test methods has advantages and disadvantages but all of them contribute to a better understanding of the staining phenomenon. Although the static method has the disadvantage of being slow, under the conditions employed it is the only test that demonstrates hydrogen evolution concurrent with corrosion of iron. The agitation test is of most value for the determination of factors that affect solution of the iron in the emulsion. For example, this test shows that cast-iron chips cause staining in one-fifth to one-half the time required for reduced-iron powder. It is also of considerable use in the study of additives that might inhibit the processes leading to eventual stain formation. The recycling test is the most rapid of the three and, since it most closely simulates plant operations, it permits the study of stain-promoting and stain-inhibiting conditions on a more practical basis.

In the static tests, the evolution of hydrogen gas is observable after an initial induction period. At this point the iron powder in the bottom of the test tubes develops a greenish-blue color, and filtered emulsion samples show the presence of ferrous iron by the ferricyanide test. These observations suggest that metallic iron undergoes oxidation and solution into the water phase according to the following reaction:

$$Fe + 2H_2O \rightarrow Fe(OH)_2 + H_2$$

In the early stages of both the agitation and recycle tests, the emulsions develop a dirty, greenish color indicative of ferrous iron, but as the tests progress the emulsions suddenly change to a tan, or buckskin, color. At this point qualitative tests indicate a predominance of ferric iron, probably formed as a result of oxidation of ferrous hydroxide by air:

$$4Fe(OH)_2 + O_2 + 2H_2O \rightarrow 4Fe(OH)_3$$

With continued agitation of the emulsions, the ferric iron concentration increases to the point where the emulsions produce blue-black staining when applied to a freshly-polished iron surface. The presence of both ferrous and ferric iron in the stain suggests the following reactions:

$$2Fe(OH)_3 + Fe \rightarrow 3Fe(OH)_2$$

$$2Fe(OH)_3 + Fe(OH)_2 \rightarrow FeO\ Fe_2O_3 + 4H_2O$$

The stain itself is believed to consist of ferrous-ferric oxide, or magnetic oxide of iron.

All of the test methods show similarities regarding pH change and development of stain on ferrous metals. In the first six hours of the agitation tests, the pH of uninhibited soluble-oil emulsions shows a drop from 8 to 6.5, as shown in Figure 2. After six hours the pH

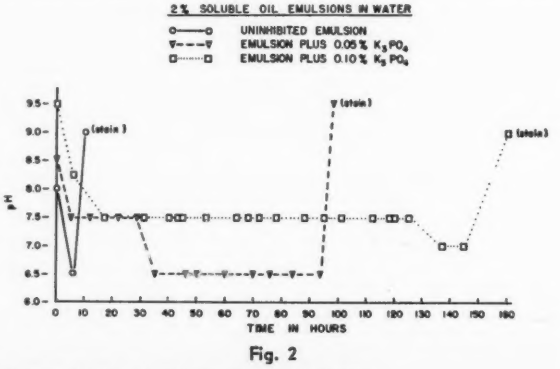

Fig. 2

Relation of stain development to pH change.

rises abruptly from 6.5 to 9.0, at which point stain development occurs.

Studies of a variety of alkaline agents, reducing agents, and corrosion inhibitors revealed none that were effective for satisfactory inhibition of stain development. As indicated in Figure 2, phosphates show some tendency to retard stain development; di- and tripotassium phosphates are more effective than monopotassium phosphates. Petroleum sulfonate soaps and such reducing agents as nitrites and sulfites inhibit stain development to a slight degree. Corrosion inhibitors of the type used in turbine oils are not effective. The presence of carbonates accelerates stain development.

Maintenance of the emulsion concentration by frequent additions of fresh oil delays, but does not prevent, stain development. Table I presents data showing the effects of restoring the original emulsion ratio by addition of fresh soluble oil. Emulsions of this particular soluble oil had produced stain after the third chip change in previous tests wherein no soluble oil was added to enrich the emulsion. Two enrichments of the emulsion by soluble oil delayed stain development from three to six chip changes (six to twelve hours). No attempt was made to prevent degradation of the soluble oil after the second enrichment of the emulsion in this particular test.

TABLE I

DELAY OF STAIN DEVELOPMENT BY MAINTENANCE OF EMULSION RATIO

Soluble Oil "A" in Water of 270-ppm Total Hardness (Recycle Test)

Chip Change	pH	Water-Oil Ratio	Stain Development
0	—	50:1	—
1	7	—	Negative
2	7	83:1	"
(Soluble oil added)	—	50:1	
3	7	57:1	"
4	7	70:1	"
(Soluble oil added)	—	50:1	
5	7-8	78:1	"
6	9-10	250:1	Positive

Once staining tendency has developed in an emulsion, it is not possible to stop it by further additions of soluble oil. The data in Table II illustrate how staining tendencies develop in an emulsion and how further additions of soluble oil fail to prevent further stain development. Experience of commercial soluble-oil users also demonstrates that once staining tendency develops in an emulsion further additions of soluble oil will not eliminate it. By way of explanation, it appears that once the ferric iron reaches a critical concentration in the emulsion, further additions of fresh soluble oil have little effect in preventing stain formation.

Investigation of the effect of water hardness on the staining phenomenon showed that emulsions of a given soluble oil develop stain more rapidly when hard waters are used. Table III demonstrates comparative rates of stain development by a soft-water-type soluble oil when emulsified with waters of 60-ppm and 550-ppm total hardness. In these tests, the use of hard water accelerates the rate of stain formation by two hours. The same trend is noticeable when a hard-water-type soluble oil is used. Table IV shows that hard water decreases the time for stain development with a hard-water-type soluble oil by one chip change, or by a time interval of two and a quarter hours. However, a comparison of Tables III(a) and IV(a) shows that use of a hard-water-type soluble oil in soft waters does not materially retard stain formation beyond the time required for a soft-water-type oil. It has been the experience in actual commercial applications that stain development is almost invariably encountered in situations where hard-water-type soluble oils are used in soft waters. This would be expected, since the very stable emulsion obtained in the soft water minimizes oil adsorption on the iron chips, and thus allows oxidation of the chips. In addition, the more stable emulsion peptizes the iron compounds and permits accumulation of these compounds in the emulsion.

TABLE II

DEVELOPMENT OF STAIN TENDENCIES AND EFFECT OF SUBSEQUENT ADDITION OF SOLUBLE OIL

Soluble Oil "B" in Water of 550 ppm Total Hardness (Recycle Test)

Chip Change	pH	Water-Oil Ratio	Stain Development
0	7-8	50:1	Negative
1	7	60:1	"
2	7-8	62:1	"
3	7-8	70:1	"
4	7-8	78:1	Positive
5	8	104:1	"
6	9	250:1	"
(Soluble oil added)	—	50:1	
7	9	62:1	"
2 hrs additional recycling	9-10	90:1	"

TABLE III

STAIN-DEVELOPMENT PROPERTIES OF A SOFT-WATER-TYPE SOLUBLE OIL

(Recycle Test)

a) Soluble Oil "A" in Water of 60-ppm Total Hardness

Chip Change	pH	Water-Oil Ratio	Appearance of Emulsion	Stain Development
0	8	54.4:1	Milky	—
1	8-9	75.7:1	"	Negative
2	8-9	96.2:1	Light tan	"
3	8-9	125:1	Tan	"
4	9	625:1	Muddy tan	Positive

b) Soluble Oil "A" in Water of 550-ppm Total Hardness

0	7-8	50:1	Milky, some free oil	—
1	8	69.5:1	Light tan	Negative
2	8	147:1	Tan	"
3	8-9	1000:1	Practically clear water	Positive

TABLE IV

STAIN-DEVELOPMENT PROPERTIES OF A HARD-WATER-TYPE SOLUBLE OIL

(Recycle Test)

a) Soluble oil "B" in Water of 60-ppm Total Hardness

Chip Changes	pH	Water-Oil Ratio	Appearance of Emulsion	Stain Development
0	7-8		Milky-Sl. Foam	—
1	7-8	56.8:1	Lt. Tan-Foamy	Negative
2	7-8	65.8:1	Tan-Sl. Foam	"
3	7-8	89.3:1	Tan-No Foam	"
4	7-8	125:1	Brown-No Foam	"
(after additional ½ hour recycle	9	417:1	Brown	Positive

b) Soluble Oil "B" in Water of 550-ppm Total Hardness

0	7	50:1	Milky-No Foam	—
1	7-8	59.5:1	Light Tan	Negative
2	7-8	69.5:1	Pale Green to Light Tan	"
3	7-8	114.5:1	Tan	"
(after additional 15-min. recycle	8-9	625:1	Tan	Positive

From the observations made in the present study, it appears that the mechanism of staining involves the following steps:

1. Solution or dispersion of iron as ferrous compounds in the soluble-oil emulsion.
2. Oxidation of the ferrous compounds to ferric compounds.
3. Flocculation and precipitation of the ferric compounds on freshly ground iron surfaces during the evaporation of water from the emulsion film.
4. Development of ferrous-ferric oxides on the metal surfaces through an oxidation-reduction reaction of the metal with the deposited ferric compounds.

Bacterial Problems

During the work on the staining problem, it was noted that pH changes in the experimental emulsions did not correspond exactly to the random results obtained from commercial operations. Investigation of this apparent discrepancy showed that the commercial emulsions were heavily infected with bacteria, whereas the experimental emulsions used in the stain work were essentially sterile. It appeared therefore that the accumulation of acidic by-products of bacterial growth caused the pH to drop to lower values, in the range of 6.5 to 7.0, and thus obscured the pH rise that was noted experimentally at the point where staining occurred.

The plant operator usually becomes aware of bacterial contamination by the development of an objectionable odor in the emulsion. This undesirable condition is generally most noticeable on Monday mornings after the week-end shutdown. For this reason the foul odor obtained is frequently referred to as "Monday morning" odor. With aeration of the soluble-oil emulsion during the workweek, the odor usually diminishes, but in many cases it permeates the clothing of the workmen and affords further grounds for complaints.

Development of foul odors in soluble-oil emulsions is almost irrefutable evidence that bacterial contamination exists. It is interesting to note, however, that even heavy bacterial contamination is not always detectable by this means. Some bacteria grow readily in emulsions and promote rapid staining of ferrous metals without ever being detected by odor. While some efforts have been made to overcome the odor problem by better plant maintenance and sanitation, and by the use of various germicides, the problem of bacterial control still exists.

Experimental

Initial phases of the bacteriological work involved investigation of the most suitable cultural media for growth of the bacteria encountered in contaminated emulsions, in order to minimize the growth suppression of organisms that might be important factors. At an early stage it was established that all the organisms isolated were aerobic and grew in the presence of oxygen, so that techniques involving a special atmosphere would not be required. It was found that either nutrient agar or nutrient broth was a satisfactory medium for growth. Bacteria population counts of contaminated emulsions were made by dilution methods both on nutrient-agar plates and in tubes of nutrient broth. Specific colonies were isolated in pure culture from the plates and transferred to microscope slides for biological staining studies and to other growth media to determine morphological characteristics. In addition, growth characteristics of the pure isolates were observed in 1:25 soluble-oil emulsions with water and in emulsions containing 2% by weight of iron filings. Growth characteristics of mixed cultures were studied in emulsions with one experimental soluble oil and eleven commercial products—including some widely accepted as of the best quality.

Results and Discussion

Thirteen isolates obtained from five contaminated emulsions were resolved into three species. One species appears to be *Pseudomonas oleovorans,* previously isolated from spoiled cutting oils by Lee and Chandler[1]. Another species appears to be *Pseudomonas putrefaciens* and is particularly capable of development of putrid odors. The third species has not been completely identified but appears to belong either to the genus *Pseudomonas* or *Achromobacter.* Eleven of the isolates will grow in pure culture in soluble oil emulsions—with or without iron filings. Two isolates will not grow readily in pure culture but appear to grow in the presence of other organisms.

Representative growth curves of mixed cultures of the isolated organisms in twelve soluble oils are shown in Figure 3. Bacterial growth is plotted as Log N/N_0 where N is the population at a given day and N_0 is the population count of the inoculum used to start the culture. Such growth curves are characteristic of closed systems wherein the amount of food is limited and no facilities are provided for addition of food or removal of by-products of growth. It appears that oil B contains a growth-promoting factor of some sort. Experimental oil J, which does not have acceptable soluble-oil properties, appears to have some inhibiting effect on bacterial growth in spite of the fact that it contains no germicides. In actual plant operations, however, none of these oils would be particularly effective in preventing growth of the bacteria encountered in this study.

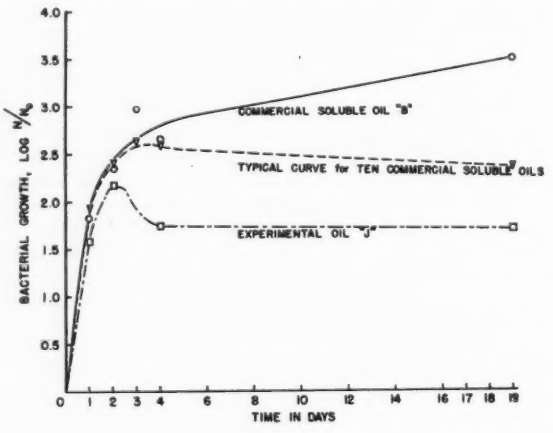

Fig. 3

Bacterial growth in soluble oil emulsions.

While the characteristics of most chemical germicides are well-known with regard to effect on staphylococci, streptococci, typhoid, and other pathogenic organisms, very little information is available regarding the effects of such germicides on organisms non-pathogenic to man and animals. Still less is known regarding the action of germicides on these organisms in soluble-oil emulsions. A rather comprehensive survey of germicidal agents has been conducted in which germicides were considered either for incorporation in the soluble-oil base

or for addition to the emulsions during use. This investigation included most of the well-known germicides under the classifications of acids, aldehydes, amines, amides, antibiotic agents, alcohols, glycols, phenols, chlorinated phenols, imides, chlorinated phenyl methanes, dyes, organic salts, oxidizing agents and quaternary ammonium compounds. It was found that all of these germicides were unsatisfactory for one or more of the following reasons:

1. Inability to kill bacteria even in pure cultures.
2. Ability of surviving organisms to accommodate themselves or develop resistance to the germicide and resume growth.
3. Toxic or irritant properties in the concentrations required to kill the organisms.
4. Unsatisfactory solubility or dispersability in soluble-oil bases.
5. Decreased potency when added to soluble-oil emulsions.
6. Destruction of germicidal activity by reaction or adsorption on iron chips.
7. Excessive cost for use in the amounts required to kill the organisms.

An alternative application of germicides involves use in water solutions to clean out contaminated machines before installing new emulsions. Recent tests by the New Britain Machine Co.[2] indicate that this procedure substantially reduces bacterial contamination, odor development, and loss of corrosion-preventive properties of the emulsions subsequently used in the machines.

Additional germicides are being investigated. While some promising leads have been found, work has not progressed to a point where any definite conclusions can be drawn.

Conclusion

The phenomenon of stain development on ferrous metals is the result of a complex series of corrosion reactions. The following preventive or remedial steps can be taken to minimize stain problems:

a. Select a soluble oil suited for the prevailing water hardness. Experience teaches that a hard-water-type soluble oil should not be used where a soft-water type will give satisfactory emulsions.
b. Provide facilities for rapid and adequate removal of iron chips—particularly the fine chips produced in grinding operations.
c. Avoid prolonged use of emulsions on finsh-grinding operations.
d. Promote conditions of plant cleanliness to prevent contamination of soluble-oil emulsions with food and other organic debris, since these materials promote bacterial growth.
e. If stain tendencies have already developed in the emulsion system and it is not possible to introduce the above precautions, rinse the finished-ground part in fresh emulsion or in a solution of cleaning compound, and change the wash solutions at least daily.

In addition to the development of foul odors, bacterial growth in emulsions appears to promote stain development on fine-ground iron surfaces. Experience indicates that existing measures of bacterial control are of spotty effectiveness at best. A need exists for more broad knowledge of bacterial contaminants in soluble-oil emulsions, as well as for satisfactory germicides to prevent or minimize bacterial growth. Soluble oils as manufactured are generally sterile. Bacterial contamination occurs during use. More rigid sanitation controls are desirable, especially in the increasingly popular large, centralized emulsion systems.

Acknowledgements

E. N. Roberts provided data on the static and agitation tests. T. H. Cafcas supplied data on the recycle tests. S. S. Deluga contributed data on the evaluation of germicides. F. W. Fabian, Michigan State College, isolated the organisms and provided considerable data and advice on the bacteriological investigations.

References

1. Lee and Chandler, J. Bact. *41*; 373 (1941).
2. Amer. Mach., p. 116, Sept. 18, 1950.

Overseas Visitors

In the April issue we commented on the growing number of ASLE members and LE subscribers in countries outside the boundaries of the United States.

We have had a corresponding increase in personal visits from our colleagues overseas.

This international interest in the subject of lubrication was personalized this summer through visitors to the National Office from England and South America.

ASLE Member:

Senor Leonidas Faermann
O. Mindel & Cia
Buenos Aires, Argentina

LE Subscriber:

Mr. J. E. Duckham
Alexander Duckham & Co., Ltd.
London

We value the opportunity to share our interest in lubrication through personal contacts.

Those of you planning a trip to the States—set aside a little time for a visit with us in Chicago.

Paging Mr. Lubrication Engineer

It would certainly seem that the National Headquarters Office of a Lubrication Society would be adequately supplied with the technical and practical information on general lubrication with sufficient personnel to keep its office machinery moving.

Following a service call for the office duplicating machine a worn and completely dry bearing was placed on your Editor's desk.

Our embarrassment was two-fold when the service man, upon reaching the outer office door and carefully noting the name of the Society, called our attention to the vocal performance of the inner office swivel chair.

During one of Chicago's rare hot and humid days, smoke was detected at one side of the desk. The penetrating odor was not of outside origin. Hurried examination proved that the electric fan had sufficient electricity but was deficient in lubricity. Proper and adequate lubrication solved the problem before it had reached serious proportions.

These amusing and fortunately not too serious occurrences are but an indication of similar happenings in every home, office, shop and industrial plant on a much-magnified scale. They present a "key-hole" view of the vastness of the lubrication problem, with its resultant cost of millions of dollars annually and the necessity and importance of the Lubrication Engineer.

THE STORAGE AND DISTRIBUTION OF LUBRICANTS*

By O. M. Albl
Thompson Prod., Inc.

Mr. Albl has been affiliated with Thompson Products, Inc., in the capacity of Lubrication Engineer for the past nine years. For thirteen years prior to this time, he served as industrial and automotive oil salesman for Shell Oil Co. and Sun Oil Co. Mr. Albl pioneered in the field of planned lubrication, and is the author of several articles on the subject.

ABSTRACT

One of the more important phases of planned lubrication is the storage and distribution of lubricants. This article includes all factors which must be considered from the time lubricants are received in a plant until they are consumed.
Economies possible in personnel, maintenance, down time of machinery and overall cost of lubrication are stressed. Points included are the proper storage of lubricants, methods of distribution to substations and lubricant protection at such points, stock control, proper application to machines, scheduling use of pipe lines vs batch transfer, fire protection and many others.

From the viewpoint of a lubrication engineer, effective lubrication begins from the time the lubricant is delivered. Obviously, everyone should be concerned with maintaining the original purity of a lubricant during its period of service; for modern lubricants receive virtually the same care as do foodstuffs when they are refined, compounded and packaged. The petroleum industry is proud of this record of purity. The fact that some steam turbines have run for many years on the original charge of turbine oil (with only the addition of make-up oil), is evidence of what can be done when plant management, persons responsible for application of lubricants, and the petroleum industry cooperate in keeping a lubricant safe from contamination and capable of doing its best work.

All this leads up to a problem which is vital in practically every industry today, i.e., how to store and handle lubricants so they will be free from contamination. Many things can happen to a lubricant to affect its quality and lubricating value after delivery and during its handling, storage and dispensing. For example, careless handling, contamination, exposure to abnormal temperature, confusion of brands or insufficient control of stock can result in leakage, spoilage, damage to equipment, excessive maintenance and loss of production. Careless or improper handling of drums can open the seams of these containers and if knocked over and allowed to strike the floor, actual breakage may result, causing leakage and a possible fire hazard from the oil-soaked floor.

Contamination with dirt accelerates oxidation and a gradual thickening of the oil takes place, resulting in a premature oil change. There are some oils which, when contaminated with water, may be rendered useless if precipitation is great enough. The storage of industrial oils and greases in a hot location can again render them useless since in the case of grease the oil may separate from the soap, making it worthless. Certain soluble oils should not be stored in a hot location since the small percentage of water necessary to maintain their stability may be evaporated and the oils turn into a worthless jelly-like mass.

The storage of industrial oils and greases in cold locations makes it more difficult to handle them. The oils flow more slowly, and the greases become stiffer. It might be extremely difficult to handle very heavy-bodied oils or very stiff greases at very low temperatures.

When certain types of lubricating and cutting oils containing fatty materials are exposed to low temperatures, the fatty materials congeal and separate from the oil.

The lack of control of the stock can result in old stock being pushed back while the fresh stock is used. In the case of certain products this may mean a loss because they are susceptible to spoilage if kept too long a time.

The great volume of industrial lubricants is packaged in drums and shipped in motor trucks or in railroad cars; in most cases the load consists of a single tier of drums, each drum standing on end. Only in unusual cases are two tiers loaded.

Unloading platforms, level with the railroad car or truck, make it easier to handle heavy drums, and lessen the possibility of damage to the containers. When an unloading platform is not provided, wooden or metal ramps should be used to slide the drums endwise to the ground or floor level. In no case should the steel drums be dropped from a truck to a cushion of discarded automobile tires. Such handling can open seams and cause leakage.

*Paper presented at 6th Annual Meeting, ASLE, Philadelphia, Pa., April 16, 1951.

Simple rolling is widely used for bringing drums to the warehouse. For short distances, this may be all right; however, the use of a two-wheel hand truck or a power truck, places less strain on the seams. For long distances, a metal track, consisting of two angle-irons or lightweight railroad rails, may be used. The drums can be moved continually along this track, and if possible, by adjusting the pitch of the track, gravity may be used. If the tracks are spaced about 3 inches wider than the hoops, the drums will stay on the track.

Unless absolutely necessary, every effort should be made to store all lubricants indoors. The possibility of contamination with water, rust and dirt is always present when lubricants are left exposed to the weather. If drums are stored on end, there is danger that rain water which collects on the head will eventually be sucked past the bung by the breathing action of the drums caused by temperature changes. Therefore, the drums should be stored on their sides and then not directly on the ground. In case of temporary outdoor storage, it is good practice to cover the drums with a tarpaulin.

Any storage area, whether only a few square feet, a separate building or several buildings, should be chosen only after a careful survey. The storage space should be located centrally and as close to the point of eventual use as possible. If a railroad or waterway is available, then consideration should naturally be given them. Future development might well take into consideration the likely possibility of air transportation of lubricants. It is just a question of time before lubricants will be delivered by air direct from the refinery to the plants which are located on runways.

It is also important when selecting the site to avoid the possibility of contamination from the manufacturing process of the plant. Dust in a cement mill is only one example. Consideration of this factor will help to place the oil storage in an area of least susceptibility to contamination and will help prevent subsequent lubrication trouble.

The size or number of storage areas will naturally depend upon the amount and number of lubricants that are used. It is, however, too often the case that sufficient space or spaces are not made available for actual storage, dispensing, mixing and reclaiming of lubricants.

In small or medium sized plants the dispensing equipment may be kept in the oil storage. In large plants, it may be necessary to store dispensing equipment in several strategic points. Experience has shown that replacement costs will be greatly reduced if each lubrication serviceman has his own equipment, such as hand oil can, grease gun, suction gun, etc., and his own space for storing them.

The central storage should be large enough so that the mixing of cutting and other oils can be done without interfering with other operations. Adequate desk space should be provided for a certain amount of administrative work such as filling requisitions, stock reports, lubrication instructions, etc.

The reclaiming of lubricants is most important and adequate space for storing the reclaimed material should be provided.

In order to conserve space it is possible to store drums on racks which may be four tiers high. This method requires the use of a portable elevator to raise and lower the drums. Arrangement of racks will, of course, consider the total amount of stock to be stored and the size of the containers. They must also take into account the necessity for reaching all products easily and also for reaching and using the oldest stock in rotation.

Petroleum lubricants in general are not hazardous. Solvents, however, are often stored in oil houses. In constructing an oil house, therefore, consideration must be given to plant safety regulations, local fire ordinances, and insurance coverage. Some plants have found that well designed oil dispensing facilities have materially reduced fire insurance premiums.

The following excerpts from the National Safety Council's Bulletin "Safe Practices" describe the most desirable construction for an oil house:

"The oil house should preferably be a separate, detached building of fire-resisting construction. Containers should not be placed upon wooden racks, but upon the cement floor, or upon concrete, metal or other fire-resisting frames, racks, or shelves. Drums, barrels, and other containers should have the caps, plugs or bungs closed at all times except when in actual use. Empty containers should always be kept closed.

"Under certain conditions, it may be necessary or desirable to provide an oil room inside a building for the storage of limited quantities of flammable liquids.

"Such oil rooms should have walls, floor and ceiling made of brick or concrete, 8-inches thick, or of reinforced concrete, 4-inches thick. All openings into the room should be provided with automatically closing fire-doors; windows should be metallic sash and frames glazed with wired glass. To prevent the accumulation of vapors in pits and other confined spaces, inside oil rooms should not be below the grade line, nor immediately above a cellar or basement. Door openings should have sills raised 6-inches. The floor should be water-proof and also up the side walls about 3-inches, making rounded corners that can easily be washed and cleaned. The floor should pitch to a drain pipe leading outside to a catch basin, or terminating at a point where proper precautions have been taken so that surrounding property will not be endangered. No drain connections should be made direct to the sewer, but through an oil separator. It is necessary to clean out the oil separator at regular intervals. Obviously, if this precaution is not taken, the separator will eventually become filled, and will then discharge the undesirable contents into the sewers. In some localities, periodical visits are made to clean out oil separators.

"Proper ventilation should be provided for inside oil rooms. There is no system of ventilation that is applicable in all cases; the method adopted necessarily varies with the nature of the gas or vapor to be removed, and depends on whether it is heavier or lighter than air. Ventilation may sometimes be secured by arranging suitably screened openings near the floor or near the ceiling or both. It may be necessary to provide a general system of exhaust ventilation by installing propeller fans at windows, or at other openings in the wall. In such cases, care must be exercised to prevent the exhausted gases or vapors from returning to the room, or from entering any other places where their presence would be objectionable or dangerous. Fans should be driven by explosion-proof motors, or by belt or shafting. An exhaust system with hoods, which catch the gas or vapor at the point of origin, is likely to be more satisfactory than general room ventilation."

To assist in the solution of ventilation problems, certain gases and vapors that are heavier than air are the following:

Alcohol
Ether
Naphtha
Petroleum
Gasoline
Benzol
Fuel oil
Varnish
Carbon bisulphide
Kerosene
Illuminating oils
Amyl acetate

The construction recommended permits easy washing-down of the whole oil house, and cleaning of lubrication equipment with suitable solvents.

Cleanliness in an oil house is essential. Regular cleaning schedules should be set up and maintained.

White paint looks cleaner and is kept cleaner than dark paints or no paint. Walls and dispensing equipment should have light colored paint, preferably white.

In no case should the inner surfaces of equipment or containers be painted, nor any surface that is normally in contact with the oil, because such contact will cause most paints to peel. Paint should be renewed frequently, including oil cans, grease-gun fillers, oil carts, etc. Cement floors should be treated to eliminate dust and to make cleaning easy. The use of sawdust or clays to dry the floors is to be discouraged, because of the possibility of contaminating the lubricants. A liquid cleaner that dries readily is more desirable.

Cleanliness of equipment is most important, whether it be a simple grease gun, or a more complicated piece of apparatus. When dispensing equipment is allowed to become fouled, it does not function properly.

Orderliness is essential. It instills orderliness in the minds of the lubrication personnel, and helps to prevent confusing the types of products dispensed. Each container and piece of dispensing equipment should bear a label showing clearly the product for which it is used. This label should coincide with the label on the package from which it is filled. Labels should be renewed frequently. Every piece of equipment should have a space reserved for it; and it should be in its place when not actually in use.

Observance of cleanliness and orderly routine will be reflected in the attitude and efficiency of the lubrication personnel. Their increased sense of pride and responsibility will have a direct bearing on the lubrication service in any plant.

It is advisable, from time to time, to conduct a survey of the lubricants used to reduce their number. By reducing the number of lubricants, the job of distribution and storage will be simplified, the possibility of mistakes will be minimized and finally, reports and necessary bookkeeping will be shortened.

The moving of lubricants from either oil houses or storage to conveniently located sub-stations is a phase of the distribution that justifies the same care as their handling in the warehouse or storage. The problem is again one of preventing contamination and confusion of products. Every container at the sub-station should be clearly marked or coded. Such equipment should not be considered interchangeable.

For small operations, it may be necessary to dole out lubricants from the barrels in one-gallon, five-gallon or ten-gallon lots. This may be done by inserting a faucet into the bung of the barrel while it is in an upright position. The barrel can then be lifted by man, crane, chain fall or lift trucks to a cradle rack which will hold it in a horizontal position. If the bung in the side of the barrel is temporarily removed or loosened, the oil can then be drawn off through the faucet into the container. These cans may then be transported to the station.

In large operations, 65-gallon lubsters may be set up at the sub-station or the original barrel can be set up on a rack after a 1½″ valve has been inserted. This is important since the oil will flow much more rapidly than if installed in the small ½″ bung.

A cabinet large enough to hold dispensing equipment such as pails, grease guns, funnels, etc. should be located at the lubrication sub-station; also any pumps whether centrifugal, air, etc. should be kept here.

The dispensing of lubricants presents a very complex problem if the job is to be done efficiently and at the least possible cost. One of the first things that must be decided upon is who shall distribute the lubricants —shall it be the machine operator, or a lubrication service man? Naturally, it should be the lubrication service man. Oiling, greasing, filling and checking reservoirs is a natural function of the lubrication department and should be done by them. The machine operator in most every case is paid a higher rate than the lubrication service man and if no other savings were effected, this alone would warrant this task being done by the lubrication department. Production is interrupted when the machine operator leaves his machine and breaks the coordination he has established.

The importance of setting up a definite schedule of frequency for each category of lubrication cannot be stressed too strongly.

This means that the machine will operate the same today, tomorrow, every day, resulting in the highest type of precision production.

It is imperative that in dispensing lubricants the right lubricant be applied in the right place at the right time. To assure this, a simple code system can be put into effect. Each oil, grease, coolant or cutting oil used is coded. A simple alphabet code will suffice. The code adopted should be put on the barrel or container in the storage before it leaves. The lubsters or tank on the floor should be coded and finally the reservoirs and tanks on the machine and equipment, so that proper lubrication is assured. Wherever possible, the code should be painted on the inside of the fill cap with paint that is impervious to oil. This will prevent the code from being worn off by the handling and cleaning necessary and from being obliterated should the machine be painted.

Each lubrication service man should be assigned to a certain section and be responsible for the complete dispensing of oils, greases, cutting oils and soluble oils. It is wise to rotate men from one section to another occasionally, especially those men who are to be trained for supervisory capacities. In this manner they become familiar with the entire plant or plants.

It may become necessary to hire women to perform some of the duties of lubrication service. In this regard, it is important to know the government regulations as to hours per week—and the weight lifting limit permitted in your individual state. Women can expertly perform the duties of hand oiling and spindle oiling. During the last war, women excelled men in these tasks. Greasing machines or any climbing should of necessity be prohibited. As an additional precaution, they should wear hair nets.

Oil leaks are expensive since not only is the oil lost but the cost of dispensing lubricants is increased as it takes extra trips to a machine to keep the reservoir filled. If machines are on a lubrication schedule, a lubrication service man will know if he is adding more than the usual amount of oil. If such is the case, a card should be hung on the machine and a record kept of the oil being used, the leak should immediately be reported to the proper person and an investigation made. The habit of using heavier lubricants to overcome leaks is false economy because sooner or later, the leak will have to be repaired. Many gallons, yes, even barrels of oil will be saved during a year. The labor involved in cleaning the floor where leaks occur should also be added to the total cost.

The use of cheap lubricants has proven to be false economy. Repeated tests have been run with cheaper oils than the standard set with the result that in every case more oil was used and in one instance, as much as twice the amount was needed because the oil broke down more rapidly resulting in more oil changes; this meant more trips to the machine to fill the reservoir and so the cost of dispensing was increased.

(*Continued on page* 246)

GLYCERINE IN MODERN LUBRICANTS

By Milton A. Lesser

Mr. Lesser is a graduate of the College of the City of New York. He has been associated with several industrial and research organizations.
He is recognized as an authority on soap and glycerine and is a frequent contributor to scientific and trade magazines. His book, "Modern Chemical Specialties," was published early this year. Mr. Lesser is a member of ACS, AAAS and the APA.

Glycerine holds an important place among modern lubricants and lubricating materials. When handling glycerine for the first time, people often comment on its smooth, oily feel. Naturally, the thought follows that this clear, heavy fluid would make a good lubricant. Glycerine does, and it has wide usage.

In addition to its body, smoothness and "oiliness," glycerine has other properties that make it invaluable. It is a wholesome, nontoxic substance, and hence is employed as a lubricant for food processing machinery, especially choppers and mixers. Because of its ability to retain its fluidity at low temperatures, glycerine is often used as a lubricant under frigid conditions, and pioneers in the field of mechanical refrigeration made good use of this characteristic. For similar reasons, and because it is a completely wholesome product, a leading producer of dairy products equipment[1] advises the use of plain glycerine as a lubricant in hardening rooms where cans of ice cream are conveyed under cold temperatures.

Glycerine rates quite high as a lubricant for rubber, according to Aquadro and Barbour[2] who compared the effects of mineral oil and glycerine on rubber catheters. At the end of 37 boilings (sterilizings) after lubrication with mineral oil, the tube was non-resilient and no longer usable. In contrast, the tube lubricated with glycerine and boiled 200 times was firm and only slightly lighter in color. Results of severe tests of this sort help to account for the extensive use of glycerine as a lubricant for rubber products, not only during their useful life but during their manufacture as well.

Where rubber products require lubrication during use, glycerine and glycerine-based lubricants are extensively utilized. In discussing the rubber-forming of light metal parts, Schulze[3] states that glycerine is a good lubricant for such procedures because it is easily applied and removed, is not objectionable to the operator, and does not hurt the rubber. For the same reasons, glycerine is employed as a mold lubricant when low melting-point alloys are cast in rubber molds. Other glycerine preparations may be employed where rubber surfaces are subject to friction and wear. One simple preparation recommended for lubricating rubber shackles on automobiles is a mixture of two parts alcohol and one part glycerine.

Suspensions of colloidal graphite in glycerine are quite extensively used for this and other rubber lubricating purposes. According to the literature of one producer of such lubricants, the glycerine content of these graphite preparations offers a number of advantages, such as: (a) it prevents quick drying, (b) it keeps lubricated parts moist and free from squeaks, (c) it lowers the freezing point, allowing efficient cold weather use, (d) it increases viscosity, adding to the ease of application, and (e) it increases retention of graphite on the lubricated spots. One such commerical preparation consists of a concentrated dispersion of colloidal graphite in glycerine having a 10 per cent solids content by weight. Glycerine-graphite preparations of a similar nature and utility are produced by a number of manufacturers.

As B. H. Porter[4] noted, glycerine-graphite preparations are also commonly used as lubricants for the stopcocks of laboratory ware and in the preparation of special purpose oils. Because it does not readily support combustion, glycerine has long been used to lubricate oxygen compressors and other equipment where oil is objectionable or hazardous. Rimarski and his colleagues[5] studied various explosion-proof lubricants and found glycerine to be the safest of all those considered.

Aside from their use with oxygen compressors, glycerine lubricants are valuable where other dangerous gases are employed. For example, it has been recommended that glycerine should be used for all lubrication of gas welding equipment. Of related interest is a lubricant suitable for use in the presence of chlorine gas. This is prepared by heating 60 parts of glycerine and 30 parts of sucrose to 120 C. until dissolved and "grinding" this mixture with 10 parts of graphite or talc in a heated mortar.

The fact that glycerine is immiscible with most organic solvents forms the basis for its extensive use in the formulation of solvent-resistant lubricants for both industry and the laboratory. For example, a composition developed[6] some years ago as suitable for lubricating gasoline pumps and similar equipment consisted of:

Oleic acid	2.5 parts
Ammonium linoleate	17.5 "
Glycerine	37.0 "
Lubricating oil	35.0 "

Other combinations of various soaps and glycerine, with or without the addition of graphite and protein material, have been described as suitable for the lubrication of systems carrying hydrocarbon gas which liquefies at normal temperatures under pressures of two or three atmospheres. In an example taken from recent patent literature[7], a colloidal lubricating grease sub-

stantially insoluble in hydrocarbon oils is made by mixing 11 to 18 per cent acetylene carbon black with glycerine to form a compound of the desired consistency. According to another patent[8], a solvent-resistant low-temperature lubricant may be prepared by mixing glycerine with zinc stearate and incorporating a small amount of a suitable wetting agent.

When reactions are carried out under pressure, the stuffing box becomes a very important part of the equipment and the choice of lubricant is a major consideration. One company recommends a glycerine-containing lubricant, Pfaudler "LB"[9], for use where oil-dissolving vapors like carbon tetrachloride, vinyl chloride, petroleum ether and the like are present. The basic lubricant consists of:

Potassium soap (Surgical soap, titer 20)	16 parts
Glycerine	4 parts
Water	1 part

To this basic lubricant, sufficient powdered mica and asbestos fibers are added to make a paste for use when installing packing. The lubricant in its basic form can be used in pressure guns for lubrication during operation and, when suitably diluted with water, the liquid product can be used in semi-automatic and fully automatic lubricators.

Over the years, research workers have developed quite a number of solvent-resistant or solvent-stable lubricants for use in the laboratory. Glycerine thickened with dextrin, bentonite, starch or the like has often been recommended for this purpose. One worker[10] found that superior results could be obtained by the use of polyvinyl alcohol and mannitol in glycerine. Later, he observed that the usefulness of such lubricants could be greatly prolonged by incorporating finely divided silica into anhydrous glycerine.

Glycerine is useful in the production of other specialized lubricants. It is an ingredient of lubricating compounds for plug valves and the like[11], and it is specified in the formulation of lubricants for the cold drawing of metals[12]. Lubricants employed in machining metals frequently contain glycerine[13] and it can also be used in making self-lubricating bearing materials[14]. The latter consists of porous metals or alloys having polar organic compounds, such as glycerine and certain of its derivatives, adsorbed or absorbed into them. Of related interest is the fact that lubricants for bearings made of or containing synthetic resins may consist of glycerine as the sole or chief ingredient[15].

Glycerine is an important component of soda-base greases, lime-base greases and other lubricants based on metallic soaps. As shown by the work of Rhodes and Allen[16] and Rhodes and Wannamaker[17], and the more recent investigations of Smith[18] and of Gallay and his colleagues[19], the presence of glycerine may have marked effects on the structure and behavior of greases. Glycerine may be present naturally, or, as is often the case, it may be added to the grease. When natural fats and oils are used to make the soap component of greases, glycerine is liberated during the fat saponification process and is commonly present in the resulting lubricants. Glycerine is an important component of a low temperature grease suitable for use at sub-zero temperatures, such as are encountered by aircraft at high altitudes[20]. It is also of interest that glycerine has been suggested as an antifreeze agent in the formulation of extreme pressure lubricants[21].

Before concluding, brief mention should be made of data which indicate that glycerine helps to control foaming in aircraft engine oils. Following work sponsored by the National Advisory Committee for Aeronautics, McBain, Ross and their colleagues[22] reported that mixtures of glycerine and Aerosol OT, are completely effective as antifoaming agents for aeronautical lubricating oil. In the Lanson engine test run at 212 F. for 24 hours, such a mixture still retained much of its antifoaming property without any bad effects on the engine. It was observed that, as long as the mixture lasted, it was more effective than the commercial antifoaming agent in general use at the time of the test. It was also found in comparative studies that glycerine does not produce an undesirable sticky residue.

This survey has briefly outlined some of the important applications which glycerine finds in the field of industrial lubrication. As new materials come into use in bearings, gears and other parts, glycerine's combination of properties can be expected to figure in the solution of many of the lubrication problems that arise.

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Book Reviews

The Fundamental Aspects of Lubrication

A Symposium by 16 authors

The New York Academy of Sciences, New York, 1951, 242 pages. Annals, N. Y. Acad. Sci. Vol. 53, Art. 4. Price $4.00.

This monograph concerns the basic problems of lubrication and recent research in those problems. Following general papers on full-fluid and thin-film lubrication, by J. T. Burwell and Harmen Blok, respectively, it presents specific studies by a variety of authors.

The influence of surface films on the friction, adhesion, and surface damage of solids is investigated by F. P. Bowden. Next, a paper on X-ray and electron-diffraction studies is presented by R. Brill. R. H. Savage examines physically and chemically adsorbed films in the lubrication of graphite sliding contacts and C. B. Davies takes up the problem of roughness and oxidation as they influence wear of lubricated sliding metal surfaces. S. F. Murray and J. T. Burwell contribute a highly interesting paper on the measurement of the incremental friction coefficient of several homologous series of straight chain hydrocarbon compounds.

There are two papers on metal cutting: one, by Hans Ernst, deals with the fundamentals of metal cutting and cutting fluid action; the other, by M. C. Shaw, reports on the metal cutting process as a means of studying the properties of extreme pressure lubricants. Other subjects include: surface chemical phenomena, by J. E. Brophy and W. A. Zisman; viscosity and molecular structure, by A. Bondi, and the fine structure of lubricating greases, by B. B. Farrington.

A final paper, by A. T. Gwathmey, investigates the use of large metal crystals in lubrication research.

The monograph is liberally illustrated and each paper carries its own bibliography. It is dedicated, with a biographical note by H. Mark, to the memory of Otto A. Beeck.

Physical Chemistry of Lubricating Oils

By A. Bondi

Reinhold Publishing Corporation, 330 West 42nd St., New York 18, N. Y. 380 pages. Price $10.00.

This valuable addition to lubrication libraries discusses the latest theories on lubricating oils and the physical and chemical principles underlying their action. Its treatment of the many problems of lubricant technology is both broad and specific.

The author is an outstanding authority who has worked for many years with practical lubrication problems in the laboratory.

His thorough coverage of such properties as viscosity, pour point, oiliness, flowing characteristics, foaming, etc., is discussed in great detail as is the general subject of additives. An entire chapter is devoted to synthetic lubricants containing much valuable data.

The work should prove most helpful to engineers, physical chemists and all technical men in the lubrication field.

HYDRAULICS CONFERENCE

The Seventh National Conference on Industrial Hydraulics will be held on November 7 and 8, 1951 at the Sherman Hotel, Chicago.

9 Panel Sessions of 2 Papers Each

Papers presented will include the following subjects: Instrumentation — Hydraulic Transmissions — Power Steering — Packings — Hose — Accumulators — 75,000-ton Press — Pumps — Pipe Threads — Oil Well Pumping and Transportation.

Among some of the outstanding discussions of particular interest to ASLE members are:

"Hydraulic Problems Requiring Solutions," by Dean Thomas K. Sherwood, M.I.T.

"Low Temperature Hydraulic Fluids," by Major J. B. Shipp, Jr., Wright Field.

"Science and Engineering," by Dean A. W. Eshbach, Northwestern University.

ASLE is actively represented in this Seventh National Hydraulics Conference. J. J. Slomer, Goodman Mfg. Co., and a past Chairman of the Chicago Section, is the Director of the Conference.

J. J. Slomer

The Executive Committee consists, among other members, of H. D. Krummell, Socony Vacuum Oil Co., and C. E. Schmitz, Crane Packing Co., President of ASLE.

F. Lee Townsend, Wm. W. Nugent Co., will serve as a panel member at one of the conference groups.

W. P. Youngclaus, Jr., Alemite Div., Stewart-Warner Corp., who so successfully carried out the role of toastmaster at the Conference banquet last year, will give a repeat performance on Wednesday evening, November 7.

Mr. Slomer, in his capacity as Director of the Conference, extends a cordial invitation to all ASLE members to attend the meeting. There will be something of interest there for everyone.

NLGI MEETING

The 1951 NLGI Annual Meeting will be held on October 29, 30 and 31 at the Edgewater Beach Hotel, Chicago. The following papers will be presented:

"The Band Type Viscosimeter for Consistency Measurements of High Rates of Shear"—H. Hull, Research Department, R. R. Donnelly & Sons, Inc., Chicago, Illinois.

"A Sales Engineer Looks at the Steel Industry"—C. C. Goehring, Esso Standard Oil Co., New York, N. Y.

"The Structure of Gels of Hydrous Calcium Stearate in Cetane, Rheological Studies ND Electron Microscopy"—R. D. Vold, H. F. Coffer and R. F. Baker, Department of Chemistry, University of Southern California, Los Angeles, Calif.

"Military Lubricants: Consolidation and Requirements"—C. W. Kelley, Munitions Board, Washington, D. C.

"An Analysis of Wheel Bearing Grease Complaints"—D. G. Proudfoot, The Pennzoil Co., Oil City, Pa.

"Phthalocyomine Lubricating Greases"—R. L. Merker and C. R. Singleterry, Naval Research Laboratory, Washington 25, D. C.

"Electron Microscope Studies of Lithium Greases: Relationship of Soaps Structure to Composition: Processing and Properties"—J. A. Brown, C. N. Hudson and L. D. Loring, Sinclair Research Laboratory, Inc., Harvey, Ill.

"Grease Milling and Deaeration"—G. H. Morehouse, Morehouse Industries, Los Angeles 65, Calif.

"Why Don't We Teach the Principles of Lubrication to Our Engineering Students?"—W. J. Ewbank, Cato Oil and Grease Co., Oklahoma City, Okla.

As we go to press we do not have all of the details regarding the other functions which will take place at this Annual Meeting.

For reservations and additional information contact H. F. Bennetts, Executive Secretary, National Lubricating Grease Institute, 4638 J. C. Nichols Parkway, Kansas City 2, Mo.

NEWS OF THE SECTIONS

Welcome Canada!

Canada has been represented in ASLE on the Directorate of the National Society and through membership affiliation with the Buffalo Section serving in some official capacities with that group.

Tuesday evening, September 11, 1951, marked the opening of the first Canadian Section of ASLE in Hamilton, Ontario. T. A. Marshall, Canadian Vice-President of the National organization was instrumental in pioneering the establishment of this most recently formed Section.

Approximately 65 members and guests, including C. E. Schmitz, President, W. F. Leonard, National Secretary, and representatives from the Buffalo Section, former ASLE President C. L. Pope and H. H. Roosa, were present.

The meeting was held in the Burgundy Room of the Fischer Hotel, one of the most unusual and outstanding settings for such an occasion.

Since many of the members of the new Section will transfer from Buffalo it was gratifying to hear from the Buffalo representatives that they were thoroughly in accord with the formation of this new group. Appropriate remarks were made by Messrs. Schmitz, Pope and Roosa.

National Secretary Leonard served as temporary chairman and after the election of officers the meeting was officially turned over to the newly elected Chairman, T. A. Marshall.

The following are the elected Officers and Directors of the Ontario Section:

OFFICERS

CHAIRMAN, T. A. Marshall, Steel Co. of Canada, Ltd., Wilcox St., Hamilton, Ont.

VICE CHAIRMAN, A. F. Thorburn, Shell Oil Co., Hamilton, Ont.

VICE CHAIRMAN, U.S.A., K. H. McHenry, Bethlehem Steel Corp., Lackawanna, N.Y.

SECRETARY, Brian Malley, Shell Oil Co., Toronto, Ont.

TREASURER, W. B. Dembner, Brooks Oil Co., 304 S. Kingsway, Toronto, Ont.

DIRECTORS

3 YEARS, Geo. T. Wright, Dominion Foundries & Steel, Hamilton, Ontario.

2 YEARS, W. J. Murray, S. F. Bowser Co., Ltd., 64 Fraser Ave., Toronto, Ont.; A. M. Fowler, Imperial Oil, Ltd., 56 Church St., Toronto, Ont.

1 YEAR, W. G. Belfrey, McColl-Frontenac Oil Co., Ltd., Hamilton, Ont.; John Boase, Lincoln Engineering, 63 Highborne Rd., Toronto, Ontario.

CHAIRMAN PROGRAM COMMITTEE, Malcolm Ambler, British-American Oil Co., Toronto, Ont.

CHAIRMAN MEMBERSHIP COMMITTEE, W. J. Murray, S. F. Bowser Co., Ltd., 64 Fraser Ave., Toronto, Ont.

The formation of this Section is unusual for several reasons: it becomes the 25th Section of ASLE, and it is the first charter to be granted outside of the territorial limits of the U.S.A.

We are extremely proud to have Canada thus more closely affiliated with the United States from the standpoint of interchange of technical information in the field of lubrication. We know that this united effort will be of great benefit to industry in both countries.

The organization promises to be the forerunner of other ASLE Sections throughout Canada.

The entire ASLE membership and the 24 Sections join in extending a sincere welcome with their best wishes for future success to the Canadian

EVANSVILLE

After much preliminary canvassing of the industrial potential in and around Evansville by Bob Garretson and Bill Kerney, a section of ASLE was formed on October 6, 1949. Elections were conducted that evening and the first officers were as follows:

Chairman . . . . . R. C. Garretson
International Harvester
Secretary-Treasurer . . . W. C. Kerney
Shell Oil Co.
Program Chairman . . . . C. J. Winter
The Texas Co.

The initial technical session held in November of that year heard W. P. Youngclaus, Jr., Alemite Div. of Stewart-Warner Corp.

The Section, despite a struggle to add to its membership, has shown a steady increase. Their growth is attributed to the following factors:

1. Better publicity in local paper
2. A telephone committee
3. A more interesting program announcement
4. Cocktails or attendance prizes, courtesy of various suupliers

At the last meeting of the 1950-51 season new By-Laws were adopted and officers elected for the coming year. R. C. Garretson, Chairman of the Evansville Section, feels that while the potential is not as large as was originally anticipated it is sufficient to support a small but extremely active Section.

Both Bob Garretson and Bill Kerney have been enthusiastic supporters of ASLE, nationally and sectionally and we trust that the membership of the Evansville Section will back them up 100%.

DAYTON

By V. C. Hutton, Secretary

"High Temperature Lubrication," by D. van der Burch, Shell Oil Co. —April meeting.

Items discussed were the following:

1. Nature of oxidation of oil and the action of inhibitors
2. Non-soap and soap type greases
3. Factors which establish properties and characteristics of greases
4. Grease testing, including the Shell Roll Test
5. Characteristics to look for in high temperature lubricants

"Industrial Waste Disposal," by P. W. Uhl, Detroit Diesel Eng. Div. G.M.C. —May meeting.

In his discussion, Mr. Uhl called attention to various types of waste, particularly mineral oils and blends of mineral oils. The importance of preventing leaks at the machine was stressed if pollution of inland waters is to be avoided. When mineral oils are present in streams they not only cause an unsightly appearance but destroy plant and animal life, become a fire hazard, ruin desirable recrea-

tional facilities, affect domestic water supplies and indicate general misuse of a dwindling natural resource.

Methods of breaking waste oil emulsions and of separating oil from water were given. Mr. Uhl also commented on plating room wastes and techniques used to render them harmless before being discharged to the sewer.

KINGSPORT

By E. L. Forbes, Secretary

"Theory and Practice in the Lubrication Field" by S. Larson, Mead Corp., and "Machine Design" by P. Galbreath, Tennessee Eastman Co. —June meeting.

Mr. Larson discussed theory and practice in the lubrication field, and the new theories and developments in lubricants.

Mr. Galbreath spoke on machine design and research in relation to efficient lubrication, bringing to the attention of the audience the latest developments in this field.

NEW YORK

By T. L. Brennan, Program Chairman

SCHEDULE FOR THE SEASON

Oct. 18, 1951: "Ball and Roller Bearings"—Leland D. Cobb, Manager of Research, Development and Design, New Departure Division, G.M.C.
Effect of modern design trends on ball bearing research.

Nov. 14, 1951: "Students' Night"—C. L. Pope, Lubrication Engineer, Eastman Kodak Co.
Mr. Pope, past president of ASLE, will discuss what management in industry expects of the Lubrication Engineer.

Dec. 13, 1951: "Gears"—The relation of their type to lubrication.
Practical selection of gear lubricants requires knowledge of gear type, speed, tooth loads, temperature and housing. Gear designers have done extensive research in this connection. Speaker to be announced.

Jan. 16, 1952: "Lubrication Panel".
This will be a round table open forum discussion of lubrication problems. A group of members representing the petroleum industry, the equipment builders and the lubricant users will be available to answer questions.

Feb. 14, 1952: "Ladies' Night".
Save the date! It is expected that this meeting will be an outstanding repetition of last year's.

Mar. 19, 1952: "Physical Chemistry of Lubricants—The Relation to Application Problems"—T. G. Roehner, Socony-Vacuum Oil Co.
Both practical and technical aspects of this subject will be presented.

April Meeting—Omitted because of Annual Meeting, Cleveland, Ohio.

May 8, 1952: "Cleaning Lubrication Systems"—A. S. Morrow, Shell Oil Co.
Being very familiar with the activities of the Turbine Oil Sub-Committee of the ASTM Mr. Morrow will tell of their work on standardization and relation of the procedures to lubrication systems in general.

YOUNGSTOWN

By J. R. McPhee

SCHEDULE FOR THE SEASON

Meetings held at V.F.W. Mural Room 2nd Thursday of Each Month Youngstown, Ohio

October: Bearings (covering the study made by ASME)—B. L. LeRoy, Republic Steel Corp., Canton, Ohio.
November: Cold Rolling of Steel—speaker to be announced.
December: No meeting.
January: Reclamation of Oil—J. D. Lykins, Wheeling Steel Corp.
February: Bosses' Night—G. L. Sumner, Westinghouse Mfg. Co.
March: Morgoil Bearings—Sam Carson, Morgan Construction Co.
April: Steel Mill Specifications—B. J. Lamport, United Engr. & Foundry.
May: Panel Group, including:
Dr. E. M. Kipp, Aluminum Co. of America
H. T. Peebles, Timken Roller Bearing Co.
A. E. Bailey, U. S. Steel Corp.—and possibly.
D. E. Whitehead, Crucible Steel Co.
June: Youngstown-Cleveland Golf Party at Youngstown.

MILWAUKEE

By E. A. Schneider, Secretary

SCHEDULE FOR THE SEASON

Oct. 15, 1951: Anti-friction Bearings Need Lubrication, and Maintenance Problems with Anti-friction Bearings—H. R. Reynolds.

Nov. 9, 1951: Rust Preventives and Mineral Oil Sulfonates—A. W. Lindert, Standard Oil Co.

Dec. 17, 1951: Christmas Party—Gordon Travers, Nordberg Mfg. Co.

Jan. 21, 1952: Industrial Diesel Engine Problems.

Feb. 18, 1952: Gear Failures—W. Schmitter, Chief Engr., Falk Corp.

Mar. 17, 1952: This program has been changed from the original Jet Propulsion to a joint meeting with E.S.M. A tentative talk by the Ethyl Corp. has been arranged. Speaker to be announced.

April 21, 1952: This meeting was changed from Army-Navy Truck Maintenance to Hydraulic Systems—Care and Operation.

May 19, 1952: Changed from the original Torque Converters to a Social Meeting under the direction of Richard Bussard, and the talk if there is one is to be entertainment only.

EVANSVILLE

By R. C. Garretson, Chairman

SCHEDULE OF THE SEASON

Meeting Time 7:00 P. M.

Oct. 18, 1951: "Lubrication Equipment"—D. Ewing, President, Alemite Co. of Ohio Valley, Louisville, Ky.

Nov. 15, 1951: "Multi-Purpose Lubricants"—J. G. Fuller, Manager, Industrial Products Dept., Shell Oil Co., Indianapolis, Indiana.

Dec. 13, 1951: "Cutting Oils"—C. A. Macfarlane, Lubrication Engineer, Sinclair Oil Co., Chicago, Ill.

Jan. 18, 1952: "The Importance of Lubrication to Management"—H. C. Daseler, Staff Asst., International Harvester Co., Evansville Works.

PERSONALS

C. E. Pritchard, for the past 14 years associated with the Republic Steel Corp., has resigned to accept a position with the Alan Wood Steel Company in Conshohocken, Pa., where he is Superintendent of all Finishing Mills.

Mr. Pritchard is a graduate of the Carnegie Institute of Technology with an ME degree. In 1937, his first year with Republic Steel, he was engaged as a millwright at the Warren District where he rebuilt and managed the installation and maintenance of mill machinery.

He assumed, in 1938, the duties of Lubrication Engineer for the Warren District until 1941, when he became Chief Lubrication Engineer of the entire Republic Steel Corporation operations, which included ore mines, coal plants, steel plants, manufacturing divisions and warehouses.

Mr. Pritchard was the first president of ASLE and has since been very active in Society Committee work. He has published several papers in the Journal and has spoken before many of the Society's sponsored groups such as the Lubrication Panel of the Plant Maintenance Shows, the recently concluded Summer Course in Lubrication Engineering at M.I.T., and the ASLE Annual Meetings.

We were happy to be advised by Mr. Pritchard that though his main work interest no longer lies in the field of lubrication he will continue to give us the benefit of his wide knowledge and experience; will affiliate with the Philadelphia Section of ASLE and give his active support in the future as he has in the past. He is, of course, very widely known in the Society and all of his many friends wish him success in his new field.

C. E. Gruen, Chairman of the Cincinnati Section, ASLE, through a promotion by his company, Shell Oil, is transferring to New York City.

The Executive Committee of the Cincinnati Section, met on August 13 for the purpose of a partial reorganization of their officers. According to the By-Laws, W. H. Cornelius, Vice-Chairman, was automatically advanced to Chairman of the Cincinnati Section. W. D. Whalen, a

(*Continued on page* 239)

ASLE SECTION OFFICERS—1951-52

Section	*Chairman*	*Vice Chairman*	*Secretary*	*Treasurer*
BALTIMORE	W. C. Bauer	William Rosenberg	H. A. Rau, Jr.	H. A. Rau, Jr.
BOSTON	E. R. Booser	J. P. Ruchinskas	A. S. McNeilly	E. M. Higgins
BUFFALO	W. H. Millett	E. W. Chapman*	R. J. Torrens	S. S. Burgess
		W. G. Belfry†		
CHICAGO	L. B. Burt	W. G. Fatch	F. J. Scott	F. J. Scott
CINCINNATI	W. H. Cornelius	W. D. Whalen	C. A. Garrison	C. A. Garrison
CLEVELAND	N. I. Whiteley	Ray Sipple	W. H. Bruns	A. O. Anderson
CONNECTICUT	A. F. Green	D. H. Van Vleck	J. S. Martin	J. S. Martin
DAYTON	W. M. Schuck	R. F. McKibben	V. C. Hutton	R. H. Ball
DETROIT	M. B. Lawton	J. W. Swain, Jr.	H. S. Wagner	J. W. Hopkinson
EVANSVILLE	R. C. Garretson		W. C. Kerney	W. C. Kerney
FORT WAYNE	J. S. Mitchell		J. W. Sites	J. W. Sites
INDIANAPOLIS	F. H. Bassett	A. D. Mook	R. C. Fatout	R. C. Fatout
KINGSPORT	S. H. Larson	W. L. Bradshaw	E. L. Forbes	E. L. Forbes
LOS ANGELES	E. E. Perso	F. H. Ott	E. A. Mohr	E. A. Mohr
MILWAUKEE	Gordon Travers	C. G. Peterson	E. A. Schneider	M. R. Skirvin
NEW YORK	Henry Muller	J. J. Scott	A. M. Southcott	R. K. Tonning
NORTHERN CALIFORNIA	F. R. Hatch	R. W. Young, Jr.	S. R. Calish, Jr.	S. R. Calish, Jr.
ONTARIO	T. A. Marshall	A. F. Thorburn†	Brian Malley	W. B. Dembner
		K. H. McHenry*		
PITTSBURGH	D. W. Sawyer	C. A. Bailey	M. C. Miller	M. C. Miller
PHILADELPHIA	R. J. Scheetz	J. H. Dunigan	J. L. Parsons	S. F. Wedemeyer
SAGINAW VALLEY	D. W. Benner		Dwight Buell	S. O. Kimball
ST. LOUIS	A. L. Heintze	J. B. Davis	M. J. Croghan, Jr.	G. M. Daily
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MILWAUKEE—E. A. Schneider, 3058 N. Maryland Ave., Milwaukee 11, Wis.

NEW YORK—A. M. Southcott, Otis Elevator Co., 260-11th Ave., New York 1, N. Y.

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1952 ANNUAL MEETING

APRIL 7, 8, & 9

Hotel Statler Cleveland

The coordinated efforts of the program, technical and industry relations committees are rapidly resulting in the most outstanding technical program in ASLE history.

FEATURES FOR 1952

PRACTICAL	SEMI-TECHNICAL	TECHNICAL
Industrial Coverage	*Plant Experience*	*Original Work*
Systemized Lubrication	*Service Testing*	*Novel Ideas*
Plant Lubrication Programs	*Designing for Lubrication*	*New Developments*

Thirty-three Technical Papers, Three Symposia and a Plant Tour to provide wide coverage, variety and balance . . . Here are some Hi-Lites of the Technical Program now being arranged:

IMPORTANCE TO MANAGEMENT: T. R. Moxley, Wheeling Steel, and G. W. Thompson, Weirton Coal, to review the importance of sound lubrication engineering to management in the steel and coal industries.

INDUSTRIAL COVERAGE: Paper machinery lubrication to be stressed in a symposium sponsored by the Industry Relations Committee. . . . T. R. Witt will present experiences in organizing and developing a successful lubrication program at Tennessee Eastman.

SERVICE TESTS: The CRC to report results of extensive fleet service tests on global greases. . . . L. J. Hibbert, National Cash Register Company, will present observations of extensive program on evaluation of lubricants for computing machines.

BALL BEARING LUBRICATION: E. R. Booser and D. F. Wilcock, Thomson Laboratory, G.E., will report on minimum oil requirements of ball bearings. Correlations have been obtained between time to failure and amount of oil.

DESIGN DATA: "Dispensing Characteristics of Lubricating Greases" by R. F. Strohecker, Beacon Research Laboratories, Texas Company, will provide fundamental background and design data.

TROUBLE SHOOTING: Nuclear physicists have their Geiger counters, for the future lubrication engineer may be using an infra-red spectrophotometer to solve service problems, according to a paper to be presented by G. Rappaport of the USAF Wright Air Development Center.

WASTE OIL DISPOSAL: P. W. Uhl, General Motors Corporation, will discuss the complex and far-reaching problem of waste oil disposal from the industrial point of view. . . . Dr. D. E. Bloodgood, Purdue University, will review, in a more fundamental paper, some of the basic factors that make the disposal of waste oil difficult.

MILITARY RESEARCH: Executive Director E. L. Klein, Panel on Lubricants, Research and Development Board, will provide information on the overall military research program in lubrication and its impact on the national lubrication picture.

WATCH FOR ADDITIONAL HI-LITES OF THE 1952 ASLE ANNUAL MEETING IN FUTURE ISSUES -- PLAN NOW TO ATTEND

LUBRICATION IN THE NEWS

OIL CONDITIONING: A booklet entitled "Turbine Oil Conditioning" gives the reasons for and describes the methods of treating used turbine oil.

The importance of continuous oil maintenance, and the factors which cause turbine oil deterioration are fully explained by charts, diagrams and phantom views.

Various types of turbine oil maintenance systems are shown with their capacities and dimensions.

Write for Bulletin 832-P.

Bowser, Inc.
1302 Creighton Ave., Fort Wayne 2, Ind.

ALL-PURPOSE LUBRICANT: "Hood Multiplex Lubricant" of the Bentone type produced in grades from No. 00 to No. 3, is manufactured with a bodying agent that is claimed to maintain complete stability under all service and storage conditions. It is said to have no melting point and, while insoluble in water, will absorb moisture when in service without losing its qualities of adhesiveness and lubricity.

This new lubricant is said to contain no metallic soaps or fatty acids and is pumpable at temperatures from —20 F. to +15 F. The manufacturer recommends the use of this lubricant for industrial equipment including water pumps, universals and wheel bearings.

Hood Refining Co.
400 S. Pennsylvania Ave., Greensburg, Pa.

HYDRAULIC FLUID: A new product known as "H-2 Non-Inflammable Hydraulic Fluid" was developed by Hollingshead research chemists in cooperation with the U. S. Navy's Bureau of Aeronautics which had been experimenting on water-glycol fluids for a number of years.

It is claimed that "H-2" is a completely new synthetic fluid which can be readily modified to meet the particular needs of any known requirement. As now produced it meets current U. S. Navy specifications for aircraft use and has been proved in over two years of laboratory and actual flight tests to fill all the requirements of this use.

A non-inflammable hydraulic fluid which is also functionally efficient will reduce fire hazards in a great number of industrial operations and may even have an advantageous effect on insurance premiums.

"H-2" is a water-glycol fluid the basic components of which are water and ethylene glycol, the remainder consisting of thickener and various additives. One of the additives is for inhibiting corrosion, both in the liquid and vapor phase, and another for deactivating certain metals in order to arrest galvanic corrosion which would otherwise exist in the metal-to-metal contacts occurring throughout a hydraulic system. The lubricity of the fluid is augmented by a highly effective anti-wear additive which increases the life and efficiency of those moving parts which rely on the hydraulic fluid for their lubrication.

R. M. Hollingshead Corp.
830 Cooper Street, Camden 2, N. J.

SPEED REDUCER BOOKLET: A pocket-size catalog of Abart Speed Reducers and Right Angle Gear Motors is announced for distribution. The 96-page book gives complete engineering data on how to select the proper speed reducer to fit requirements, including horsepower ratings, ratios and installation graphs. A copy of the catalog may be had by writing the manufacturer.

Abart Gear & Machine Co.
4834 West 16th St., Chicago 50, Ill.

UCON LUBRICANTS: This eight-page booklet on UCON synthetic lubricants describes their high-temperature applications in glass and ceramics manufacturing.

Whenever sludge, gum, and carbon deposits from oils necessitate frequent shutdowns for cleaning and repairs, it is claimed that these lubricants often provide longer service life at lower cost and eliminate much maintenance work.

How to use these lubricants in oven-chains and drives, gears and bearings operating at high temperatures is presented in detail in this booklet. A complete list of their properties and advantages is also included.

Write the manufacturer for free copies.

Carbide and Carbon Chemicals Co.
30 E. 42nd St., New York 17, N. Y.

PERSONALS

(*Continued from page* 235)

member of the Executive Committee and Chairman of the Section News Committee, was elected Vice-Chairman. D. W. Moore will now assume Mr. Whalen's previous duties.

The Cincinnati Section regrets very much the loss of Mr. Gruen as Section Chairman. They and Mr. Gruen's many friends wish him success and happiness in his new work.

Dr. M. Eugene Merchant, formerly Senior Research Physicist, The Cincinnati Milling Machine Co., has recently been promoted to the position of Assistant Director of Research with that company.

Dr. Merchant received his B.S. in Mechanical Engineering from the University of Vermont. His graduate work was done at the University of Cincinnati in the Graduate Department of Applied Science under a cooperative fellowship sponsored by The Cincinnati Milling Machine Co. Here he majored in Physics and received the Doctor of Science degree in 1941. He has been employed since in the Research Department of The Cincinnati Milling Machine Co., carrying out applied research on metal cutting, cutting fluids, friction and lubrication. He has published numerous papers relating to these subjects and has authored chapters on machining in a number of recent books.

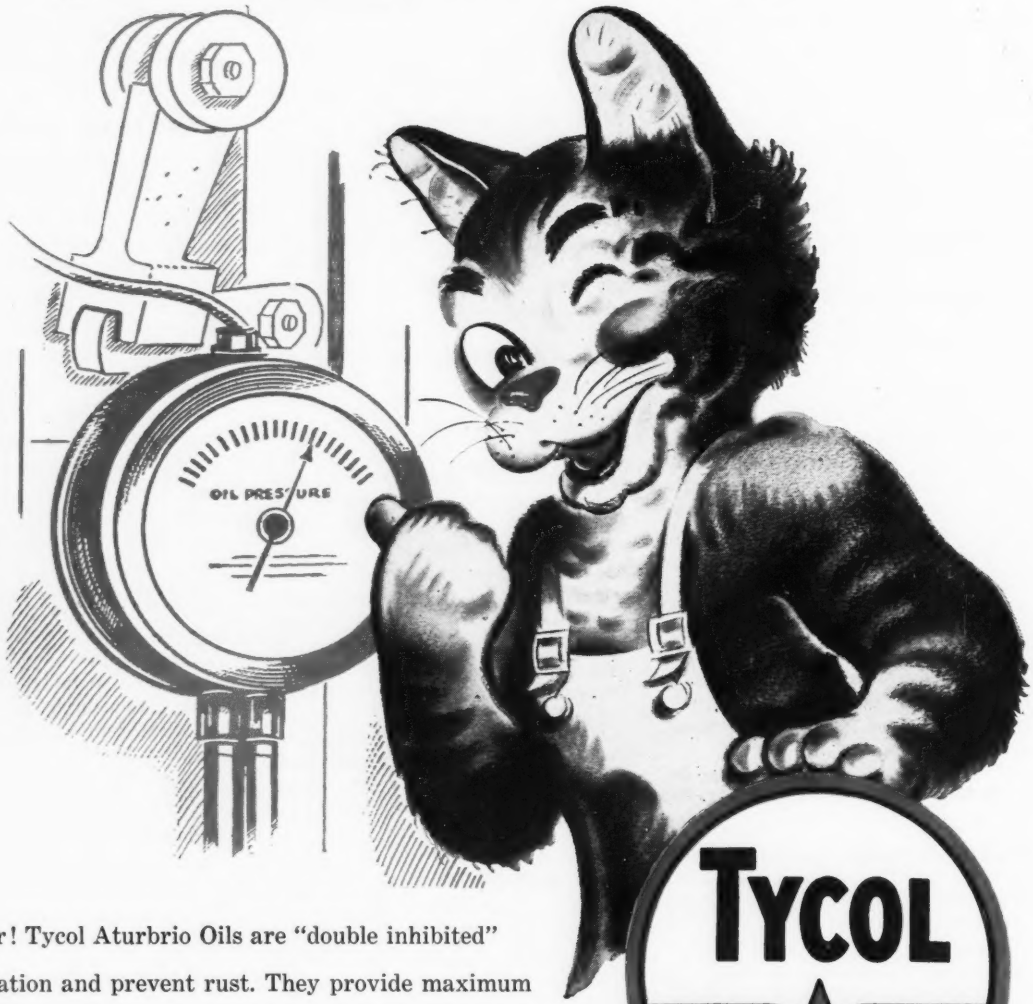
He has served as a National Director of the American Society of Lubrication Engineers, and is at present Mid-Western Regional Vice-President and Chairman of the General Technical Committee. He is also active on several ASTM and ASME technical committees in the fields of lubrication and metal cutting.

He is a member of various technical societies, including ASLE, ASM, ASME, APS, ACS and OSA.

Honorary fraternities include Phi Beta Kappa, Tau Beta Pi, and Sigma Xi.

(*Continued on page* 251)

"Tycol Aturbrio remains stable... gives full protection against system moisture corrosion"



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CURRENT LITERATURE

Corrosion, Vol. 7, No. 7, July, 1951

ADDITIVES FOR LUBRICATING OILS.

Booser, E. R.—p. 122A
(Gen. Elec. Rev., Vol. 53, No. 8, pp. 9-13, Aug., 1950)

The addition of chemical additives to lubricating oils changes certain properties which make them rather limited in utility. Oxidation inhibitors, rust inhibitors, lubricity agents, viscosity index improvers and pourpoint depressants and defoaming agents are discussed. Oxidation curve and curve showing the reduction in friction is given. 17 references.

THE IMPORTANCE OF SURFACE OXIDE FILMS IN THE FRICTION AND LUBRICATION OF METALS. PART I. THE DRY FRICTION OF SURFACES FRESHLY EXPOSED TO AIR. PART II. THE FORMATION OF LUBRICATING FILMS ON METAL SURFACES.

Tingle, E. D.—p. 122A
(Faraday Soc., Vol. 46, pp. 93-102, Feb., 1950)

THE MECHANISM OF LUBRICATING OIL BREAKDOWN AND ITS RELATION TO OIL CORROSION.

Weiland, W. F.—p. 122A
(Scientific Monthly, Vol. 71, pp. 121-122, Aug., 1950)

Institute Spokesman, Vol. 15, No. 3, June, 1951

EVALUATION OF THE ANTI-WEAR PROPERTIES OF GEAR GREASES.

Ninos, N. J.—pp. 8-10, 11-13, 15-18, 21-23, 25-27

From the precision and the spread of the levels of rating for the several greases tested using brass-on-stainless steel gears, it is shown that the Navy Gear Wear Tester affords a sensitive means of evaluating the anti-wear characteristics of greases for brass-on-steel applications. Extreme pressure agents are indicated to cause increased wear on brass-steel and bronze-steel combinations. The results obtained on the silicone greases indicate their poor lubricating properties for brass-steel, 24ST aluminum-steel and steel-on-steel applications; however, fairly low wear rates were obtained with the silicones when lubricating phosphor bronze-steel gear combinations. Ten charts summarizing data are included.

Mechanical Engineering, Vol. 73, No. 6, June, 1951

SOME INDUSTRIAL EXPERIENCES WITH SYNTHETIC LUBRICANTS.

Sweatt, C. H. and Langer, T. W.—pp. 469-476

Several types of synthetic lubricants differing in chemical structure and properties are now available commercially. These lubricants range in consistency from very light to highly viscous liquids. The introduction of polyalkylene-glycol lubricants created an immediate commercial interest. A number of specific practical and successful experiences under widely different operating conditions are described in this paper. It has been shown that the special physical and chemical properties of the polyalkylene-glycol lubricants have proved advantageous in various types of industrial service.

Petroleum, Vol. 14, No. 4, April, 1951

SILICONE LUBRICANT

Anon.—p. 113

Laboratory tests and limited experience in industrial plants have indicated that a new lubricant, Dow-Corning 710G silicone fluid, is satisfactory for conveyors under light loads at temperatures ranging from zero to 700 F. In service, trolleys lubricated with it have shown no tendency to harden or "lacquer up." The lubricant is said to remain liquid and free from stickiness, so that the graphite contained in solution functions satisfactorily. This type of conveyor lubrication is satisfactory up to 700 F. under loads as high as 400 lb. Previous experience with mineral oils under these conditions had resulted in excessive carbonizing.

No. 5, May, 1951

PORTABLE VISCOMETER

Anon.—p. 135

A new portable viscometer developed in England gives immediate readings of viscosity on a scale calibrated directly in poises or centipoises.

No. 6, June, 1951

RUST INHIBITOR-LUBRICANT.

Anon.—p. 164

Recently developed in the United States is an oil base soluble in an aqueous medium and adapted for use as a rust inhibitor. According to the patent, the compound will also act as a metal-working lubricant. It contains 11.8 parts water, 2.4 parts sodium hydroxide, 2.2 parts formalin of about 40% formaldehyde, 6.1 parts glycerin, 5.8 parts ethylene glycol ethyl ether, 16.6 parts hydroxy aliphatic hydrocarbon carboxylic acid having 18 carbon atoms and not more than one double bond in the molecule, 46.1 parts of oil-soluble sodium petroleum sulphonate, and 9 parts of extra winter strained lard oil. It is blended with a liquid petroleum oil base, which comprises from 70% to 90% of the mixture.

Petroleum Engineer, Vol. 23, No. 4, April, 1951

LUBRICANT DEMAND RISES

Anon.—p. C-83

The United States demand for lubricants totaled 53,105,000 bbls. in 1950, a gain of 15.4 per cent from 1949, the Bureau of Mines has reported.

Petroleum Processing, Vol. 6, No. 4, April, 1951

FURTHER CONFUSION CONCERNING HEAVY-DUTY OILS

Anon.—p. 339

The recent announcement from General Motors that HD (heavy-duty) type oils will be recommended for some of its new models, where such oils are available, is seen by automotive engineers with the oil companies as creating confusion as to when this type oil is actually required. A further disadvantage may be to add to the already existing shortage of some of the metal compounds used as detergent additives for these oils, if more oil companies try to bring their premium oils up to the new heavy-duty standards.

"PRESTONE" SYNTHETIC LUBE AGAIN ON THE MARKET

Anon.—p. 340

At present Carbide & Carbon Chemicals Corp. is limiting sales of the synthetic for use in either new cars or cars with new or rebuilt engines. According to a spokesman, the oil acts as a solvent to clean varnish, gum, resin and carbon deposits from an engine. Primary selling feature of the Prestone oil appears to be an extended drain period. Although no indication of the nature of the material is given, it may be related to the "Ucon" series (synthesized from natural or other hydrocarbon gases).

NATIONAL PETROLEUM ASSOCIATION—ADDITIVES FOR HEAVY DUTY LUBES

Anon.—pp. 422, 433

Present and future trends in additives for "Heavy Duty Type" lubricating oils was the subject of a panel discussion held during the 48th semi-annual meeting of the National Petroleum Assn. in Cleveland, April 18, 19 and 20.

MAKING LUBRICATING OILS OF EXTRA HIGH VISCOSITY INDEX

Gaylor, P. J.—pp. 405-406

A recent U. S. patent (2,489,300) describes a new viscosity index additive composed in part of cellulose ethers of aliphatic alcohols.

Petroleum Refiner, Vol. 30, No. 6, June, 1951

RIG TO TEST HIGH-SPEED GEARS DEVELOPED BY TEXACO.

Anon.—p. 167

A test rig based on a machine originally designed for bench testing gears and lubricants has been converted by the engineering department of The Texas Company's Beacon, N. Y., laboratories into an improved method for testing the critical lubrication requirements of high-speed precision gears. The "new" rig incorporates design features which extend the speed and load range to permit speeds up to 16,000 rpm. under loads which are the equivalent of those loads present in operations where small gears transfer 5000 hp.

APPARATUS TESTS LUBRICANT CHANGES UNDER PRESSURE

Anon.—pp. 154, 156

Socony-Vacuum Oil Company, Inc., has disclosed a method for determining the effectiveness of lubricants at pressures previously impossible to measure with scientific accuracy in ultra-thin films. Essentially the new measuring apparatus developed at Socony's Paulsboro laboratories, is a vertical and a horizontal steel cylinder, each cylinder a quarter-inch in diameter, oriented at right angles to each other. The horizontal cylinder is maintained in a fixed position while the vertical one is capable of being rotated

(*Continued on page* 243)

OILS AND LUBRICANTS
PATENT ABSTRACTS

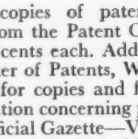
Printed copies of patents are available from the Patent Office at twenty-five cents each. Address the Commissioner of Patents, Washington, D. C., for copies and for general information concerning patents.

From Official Gazette—Vol. 648, Nos. 1, 2, 3, 4, 5; Vol. 649, Nos. 1, 2, 3, 4.

PREPARED *by* ANN BURCHICK

Synthetic Lubricant—Patent #2,559,521—Paul V. Smith, Jr., and Alexander H. Popkin, assignors to Standard Oil Development Co.

As a new composition of matter a compound of the formula



where R is an organic group consisting of saturated aliphatic hydrocarbon radicals interlinked by at least two oxygen atoms, the total number of carbon and said oxygen atoms in the group R being from 3 to 85, the number of oxygen atoms being at least 2, in which there are at least two carbon atoms between each pair of said oxygen atoms and at least one carbon atom between the carboxyl group and the nearest of said oxygen atoms; where R′ and R″ are organic groups selected from the class consisting of (1) saturated branched chain aliphatic hydrocarbon radicals containing a total in the two groups of 16 to 40 carbon atoms and (2) radicals consisting of a series of saturated aliphatic hydrocarbon radicals linked through 1 to 5 non-carbon atoms in each group of the class of elements consisting of oxygen and sulfur, the number of sulfur atoms being not greater than 2, and the total number of carbon and said non-carbon atoms in the two groups R′ and R″ being from 8 to 40, there being at least 2 carbon atoms between each pair of said non-carbon atoms and between the carboxyl group and the nearest such non-carbon atom; the components of the composition being so chosen that the molecular weight thereof is at least 300.

Composition and Method for Removing Oil Sludge—Patent #2,559,574—Melvin Weissberg, assignor to Irving J. Rifkin and Alfred Turman.

The method of dispersing petroleum sludge which comprises bringing the surface of the sludge into contact with a solution of a minor proportion of an oil-soluble and hydrophilic surface active agent in a solvent selected from the group consisting of coal tar neutral oil of specific gravity at least about 1 and an aromatic neutral hydrocarbon oil of specific gravity at least approximately 1 and of boiling range about 258 C. to 353 C., the surface active agent being selected from the group consisting of petroleum sulfonate,, the condensate of triethylene glycol with oleic acid, and triethanolamine oleate.

Process of Preparing Polymeric Lubricating Oils—Patent #2,559,984—Charles W. Montgomery and Wm. L. Gilbert and Robert E. Kline, assignors to Gulf Research & Development Co.

The process of preparing a polymeric lubricating oil having a high viscosity index which comprises continuously contacting an olefin, which contains at least 3 carbon atoms, while in the liquid phase with a halid polymerization catalyst at a temperature of between about-20 C. and 40 C., and polymerizing at least about 10% but not more than about 20% monomer to polymer.

Friction Material Lubricant—Patent #2,560,051—Roy W. Brown, assignor to The Firestone Tire & Rubber Co.

A thixotropic lubricating composition substantially composed of the following ingredients, in parts by weight:

Castor oil	29 to 46
A waxy lubricant of the group consisting of hydrogenated castor oil, beeswax and lanolin	48 to 64
Aluminum soap of castor oil fatty acids	2 to 3

Dehazing Hydrocarbon Oils—Patent #2,560,193—Bernard H. Shoemaker, assignor to Standard Oil Co.

In a process for refining a substantially wax-free petroleum oil of satisfactorily low pour point which develops a visible haze on being cooled to a low temperature, the improvement which comprises intimately contacting said oil with urea for a period of time sufficient to react the organic haze-forming substances in said oil with said urea, and separating the resulting urea reaction product from said oil, whereby a haze-free oil is obtained.

Hydrocarbon Plasticizers for Oil Resistant Polymers — Patent #2,560,339 — Albert M. Gessler, assignor to Standard Oil Development Co.

The method of plasticizing polymers comprising mixing 100 parts of an oil resistant conjugated diolefin-nitrile copolymer with 15 to 30 parts of a hydrocarbon oil having a viscosity between 50 to 11,000 Saybolt seconds at 100 F. and an aniline point between 100 F. and 170 F. and with 40 to 100 parts (per 100 parts of said oil) of an oil-soluble solid hydrocarbon polymer, and mechanically working the resulting mixture until at least 5 parts of said hydrocarbon polymer are dissolved in said oil.

Desulfurization of Hydrocarbon Oils — Patent #2,560,433—Wm. I. Gilbert and Wm. A. Horne, assignors to Gulf Research & Development Co.

The process for desulfurizing a sulfur-containing hydrocarbon oil which comrises treating vapors of said oil with a contact agent comprising a member of the class consisting of metals of the iron group and their oxides composited with a silica-alumina refractory catalytic material capable of promoting, to a substantial extent, the conversion of higher boiling hyrocarbons into lower boiling hydrocarbons and having a conversion index of above about 15, in the presence of hydrogen, at a temperature between about 600 F. and 950 F., terminating this treatment when a substantial amount of hydrogen sulfide appears in the treated vapors, regenerating the contact agent at a temperature above about 1000 F. to remove substantially all of the sulfur therefrom and employing the regenerated contact agent to treat vapors of a sulfur containing hydrocarbon oil in the presence of hydrogen under the conditions specified above.

Recovery of Lubricating Oil from Solvent Extracts—Patent #2,560,448—Wm. C. Jones, Jr., assignor, by mesne assignments, to Standard Oil Development Co.

A method for recovering high viscosity index lubricating oil fractions from low viscosity index solvent extracts of lubricating oils which comprises forming a mixture of a low viscosity index solvent extract of a lubricating oil and a light paraffinic hydrocarbon, said solvent extract containing high viscosity index components forming a bed of silica gel having a particle size in the range between 28 and 350 mesh, contacting the mixture with the bed of silica gel at a temperature in the range between 60 F. and 200 F. with said silica gel being in excess of said extract to cause selective adsorption by the silica gel of low viscosity index constituents in said mixture, removing unadsorbed mixture from contact with said bed, and recovering from said unadsorbed mixture by distillation high viscosity index lubricating oil fractions.

Production of Lubricating Oils — Patent #2,560,479 — George Riethof, Charles W. Montgomery and George P. Brown, Jr., assignors to Gulf Research & Development Co.

A method of producing a lubricating oil which comprises subjecting a solvent extract of a lubricating oil distillate stock containing at least 15% by weight of the solvent extract, of hydrocarbons boiling within the range of about 300 C. to about 400 C. at 10 mm. mercury absolute pressure, to distillation under conditions adapted to minimize cracking, collecting distillate hydrocarbons boiling within the range from about 300 C. to about 400 C. at 10 mm. mercury absolute pressure and constituting at least 15% by weight of the solvent extract, subjecting said distillate hydrocarbons to a mild sulfonation treatment effective to sulfonate the more easily sulfonatable of said distillate hydrocarbons but ineffective to cause appreciable oxidation of said distillate hydrocarbons such as to form objectionable amounts of sludge, said mild sulfonation treatment corresponding to the sulfonation with about 20 to about 50% by weight of said distillate hydrocarbons of sulfuric acid of about 93 to 98% H_2SO_4 concentration at substantially atmospheric temperature and with a time of treatment of less than about 5 hours to produce an unreacted oil layer containing dissolved oil-soluble sulfonic acids and a sulfonating agent layer, separating the unreacted oil layer from the sulfonating agent layer, removing oil soluble sulfonic acids from said unreacted oil layer, and recovering the resulting lubricating oil.

Clean-Burning Carbonaceous Compositions —Patent #2,560,542—John D. Bartleson and Everett C. Hughes, assignors to The Standard Oil Company.

A lubricating composition which is relatively clean-burning and also relatively stable against oxidative deterioration at temperatures in the range of room temperature to crankcase temperatures, comprising a mineral lubricating oil as the essential and primary component having dispersed therein an amount within the range of 0.25% to 0.50% by weight of chromium naphthenate and an amount within the range of 0.25 to 0.50% by weight of a carboxylate salt selected from the group consisting of manganese naphthenate and copper oleate, to promote clean burning at combustion temperatures, and as an anti-oxidant about 1% by weight of the recation product of P_2S_5 with hydrogenated sperm oil.

Method of Processing Lubricating Oils by Treating with a Phosphorus Sulfide and the Resulting Products — Patent #2,560,543 — John D. Bartleson, assignor to The Standard Oil Co.

A method of processing lubricating oil stock consisting essentially of hydrocarbon material to yield an oil having improved inhibition to oxidation in service, which method comprises treating said stock with an amount in the range of about 0.1 to 0.75% by weight of a phosphorus sulfide at a temperature in the range of 275 F. to 450 F.

Method of Processing Lubricating Oil by Treating with Sulfuric Acid, A Phosphorus Sulfide and Clay, and The Resulting Product — Patent #2,560,544 — John D. Bartleson, assignor to The Standard Oil Co.

A method of processing lubricating oil stock consisting essentially of hydrocarbon material to yield an oil having improved inhibition to oxidation in service, which method comprises treating said stock with sulfuric acid in a conventional manner, then treating the resulting acid-refined hydrocarbon with an amount in the range of about 0.1 to 0.75% by weight of a phosphorus sulfide at a temperature in the range of about 275 F. to 450 F., and including a separate clay-treating step subsequent to the acid-refining step.

Method of Processing Lubricating Oil by Solvent-Extraction and Treating with a Phosphorus Sulfide and Clay and the Resulting Products — Patent #2,560,545 — John D. Bartleson, assignor to The Standard Oil Co.

A method of processing lubricating oil stock consisting essentially of hydrocarbon material to yield an oil having improved inhibition to oxidation in service, which method comprises solvent-refining said stock, treating the resulting solvent-refined hydrocarbon with an amount of a phosphorus sulfide in the range of about 0.1 to about 0.75% by weight at a temperature in the range of about 275 F. to 450 F., and then treating the resulting product with clay.

CURRENT LITERATURE

(*Continued from page* 241)

under pressure or for exertion of direct pressures up to 250,000 psi. at the contact point.

Platt's Oilgram, Vol. 29, No. 92, May 9, 1951

ARMY COMPLETES "ALL TEMPERATURE" GREASE RESEARCH

Anon.—p. 2

A new "all-temperature" grease—Specification No. MIL-G-10924 (ORD)—has been adopted for use on all Army vehicles and artillery pieces, officially superseding at least three old grease "specs"—Army 2-106, Ordnance AXS-781 and Ordnance AXS-1169—and due to replace several additional ones. New lubricant, army reported, performs equally well in tropic heat or arctic cold. Copies of new "spec," plus additional information can be obtained from Office Chief of Ordnance Research & Development Division, Research & Materials Branch, The Pentagon, Washington 25, D. C. Army urges that all written inquiries be "very specific" on details requested.

Power, Vol. 95, No. 4, April, 1951

DIESEL INSTRUMENTS AND CONTROLS: 7 TIPS ON GUARDING ENGINE LUBRICATION

Kates, E. J.—pp. 80-83

A prime reason for lubrication is, to reduce friction and wear. With this goes carrying away heat from rubbing surfaces—pistons, rings, bearings, valve stems, cams, etc. Some heat comes from friction, some from combustion in the cylinders. Higher specific outputs of modern engines put more heat load on pistons. Holding needed pressure is primary control job. Pressure delivers oil to bearings and through bearing clearances, also through lubricating orifices at gears, etc. It is standard practice to use an oil-circulating pump having excess capacity. Oil that cannot find its way through bearing clearances and other orifices discharges from the pressure system through a relief valve. To assure needed pressure at all lubricating points, pressure-regulating valve is at point where pressure is likely to be lowest, or is controlled by pressure at that point.

No. 5, May, 1951

LOW-COST FILTERS CHASE OIL FROM CONDENSATE

Plummer, I. L. and Peebles, J. H.—pp. 75, 196, 198

The system of filter installation adopted by the B. F. Nelson Manufacturing Co. to get rid of oil in condensate and exhaust set up is given.

No. 6, June, 1951

WAYS TO CLEAN TURBINE LUBE SYSTEM

Anon.—pp. 98-99

Some of the indications that the lubricating system may need cleaning are the following: Increased rate of deposits removed by oil-purifying equipment, abnormal oil pressure at any point in the system or oil-purifying equipment, water in the oil, change in temperature differential, change in oil test. Hot water or steam washing or petroleum flushing-oil are usually used for cleaning oil side of coolers. But regardless of material, all traces of the cleaner must be removed. Suggestions for cleaning with steam, hot water and flushing-oil are given.

Power Engineering, Volume 55, No. 6, June, 1951

AIR JET LUBRICATION

Anon.—p. 7

Entirely new concept of lubrication involving air bearings or air jet lubrication, is now being investigated, according to The Ohmite News. Film of air acting as lubricant is only 0.001 inch thick, fed into bearing races through small tubes 0.003 inch diameter. Spindle speeds of 150,000 rpm. claimed. With sliding members, 7½ ton block of steel, supported by air film, can be easily moved.

No. 7, July, 1951

OIL CONDITIONER IS 25-40 GPH UNIT, SPECIFICALLY FOR SMALL-BATCH CLARIFICATION.

Anon.—p. 46

This new conditioner is intended for small-batch clarification of used hydraulic, lubricating, run-in and transformer oils. (Product of Filtration Div., Hoffman Machinery Corp.)

(*Continued on page* 245)

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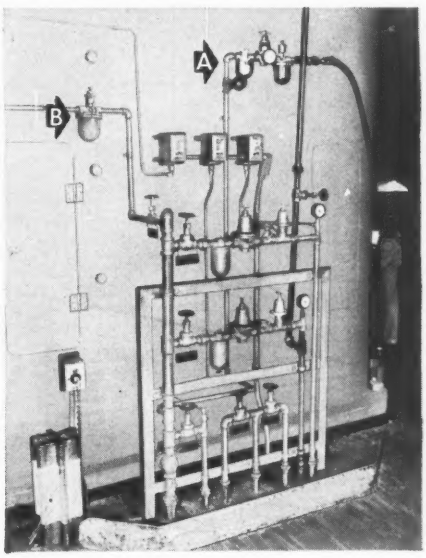

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SHELL

SHELL ALVANIA GREASE

(*Continued from page* 243)

Producers Monthly (Secondary Recovery), Vol. 15, No. 6, April, 1951

LUBRICATING GREASES FROM PENNSYLVANIA OILS

Garin, T. J.—pp. 34-35

The advantage of plastic lubricants is that they stay where they are applied and with modern equipment in the matter of guns and fittings, it is relatively easy to replenish the supply of lubricant required. All greases are dispersions of soap in oil. The lubricating properties of a grease depend upon the characteristics of the mineral oil as well as upon those of the soap used for compounding. Soda soap lubricating greases find their niche automotively in wheel bearings and in certain universal joints. Aluminum soap lubricants, while higher in cost than the lime soap greases, have some properties that justify their choice. For chassis lubrication, for example, their fluid, yet tacky or adhesive qualities are beneficial. Barium and lithuim greases have come to the fore. The latest advance in the field of plastic lubricants is the soapless or Bentonite greases.

No. 8, June, 1951

HIGH PRESSURE CHARACTERISTICS OF LUBRICATING OIL.

McCrone, W. C.—pp. 37-39

High pressure measurements on oils of various types serve as a basis for the following general conclusions: 1. Paraffinic oils show greater compressibility under high pressure and, at the same time, less viscosity increase than naphthenic oils. The high viscosity index charactertistic of paraffin oils is a temperature-viscosity function which now seems to correspond to a high viscosity index for these oils in terms of a pressure-viscosity function. In other words, there is less change in viscosity with pressure for paraffinic oils than for naphthenic oils. 2. Paraffinic oils are more fluid at a given high pressure than naphthenic oils; or better, paraffinic oils flow more readily under high pressure than naphthenic oils. 3. All oils solidify at a characteristic high pressure. This solidification pressure is significantly higher for paraffinic oils than for naphthenic oils. In other words, naphthenic oils become rigid at pressures below the corresponding pressures for paraffin oils.

Revue de L'Institut Francais du Petrole et Annales des Combustibles Liquides, Vol. 6, No. 3, March, 1951

THE ABC OF LUBRICATION. II. ARTIFICIAL LUBRICANTS

Anon.—pp. L9-L16

The synthetic products considered include polybutenes, polypropylenes, polyalkylene glycols (trade name Ucon), silicons, chlorodiphenyls, tricresyl and triphenyl phosphates and Voltol. Physical properties of lubricants are classified into optical, mass, superficial, thermal, electrical and physico-chemical.

Reviews of Petroleum Technology, Vol. 10 (covering 1948), Institute of Petroleum, London, 1951

(*Continued on page* 247)

YOUR COPY IS READY!

● A new 12-page booklet on Turbine Oil Maintenance has been prepared under the direction of Edwin M. May, a nationally recognized authority on lubrication engineering. A member of the Bowser sales engineering staff for many years, he has an M. E. Degree from Purdue, is Chairman of the New York Section of A.S.L.E., is a member of the Petroleum Applications Committee of A.S.M.E. and the Turbine Oils Committee of A.S.T.M.

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The Storage and Distribution of Lubricants

(*Continued from page* 230)

In another instance a better grade of oil was used than the standard set. This oil was used for hand oiling. It stayed on the parts two to three times as long as the cheaper oil. Result: fewer workers needed, less oil, resulting in lower costs and the machine functioned better because of the better lubricant.

Nine years ago, at Tapco, we set up a schedule which called for the use of one grease to take care of about 80% of our requirements. This resulted in less walking or dispensing time since the lubrication man made one round in his section, instead of several trips as would have been the case if several greases had been used. This program was also followed in setting up recommendations for each machine. The policy followed has been that the least possible number of lubricants used by any one machine the better. Never lower a standard but better it if in so doing the distribution cost is cut. This again results in the use of less oil, better lubrication and better production.

Other features which will save distribution costs are such items as the installation of larger oil cups, sight level gauges, centralized grease and oil pumps which grease or oil a number of points from a centralized mechanical or motor driven pump on a machine. The use of air pumps, electric pumps and better dispensing equipment such as four-wheel dollies with extra large wheels to transport oils, coolant mixtures and cutting oils in their original containers further increase distribution efficiency.

Central systems will do much to reduce distribution costs of soluble oil emulsions and they should be installed wherever possible. These systems call for a tank, the size of which will be determined by the number of machines to be serviced, where the soluble oil and water can be mixed; then, by means of a series of pipes the emulsion is pumped from the tank to the individual tank or machine and returned to the original tank. One type of central system has a continual chain to which scrapers are attached to carry out the sludge as it settles to the bottom of the tank.

The use of pipe lines is another feature to be considered. However, there are comparatively few companies on the whole large enough to require that a particular oil be bought in tank wagon or tank car lots. For such users a tank or tanks should be installed in the basement of the oil storage if room permits or the tank should be buried outside, next to the building within the existing law limits. It is important to remember that buried tanks must be partially filled with oil lest it rain and cause them to rise to the surface, due to the earth expansion. If the oil is not immediately available, water can be used and later pumped out. The suction line should be kept several inches from the bottom of the tank to allow for sediment.

Pipe lines should have drops at least every 100 feet so that a hose can be attached and the machines within the area serviced direct. Individual hoses can be installed at each drop or one hose can be wheeled from drop to drop. It will be possible in the near future to transport two or three oils through the same pipe. These lines eliminate the storage and handling of many barrels and they also reduce manpower.

A portable filter has proven to be a valuable asset to any lubrication department. Hydraulic oil may be filtered while the machine is in operation. This reduces the down time due to oil changes to a minimum. Since it is possible to filter the oil several times before it becomes unusable, great savings are effected in the oil consumed and the subsequent storage space and manpower needed.

A time study is very important to any lubrication department since it shows exactly the number of men necessary to distribute lubricants, especially where a program of scheduled lubrication is to be put into effect. A system will not endure if the help is inadequate to maintain it.

In the final analysis, the success of any lubrication department depends upon the awareness and cooperation of management.

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(*Continued from page* 245)

LUBRICANTS

Beynon, J. H.—pp. 196-228

This review considers the following subjects: greases, oxidative deterioration of mineral oils, synthetic lubricating oils, metalworking oils, steam-turbine oils, steam-cylinder oils, refrigerating oils, penetrating oils, miscellaneous lubricants, friction lubrication and wear, foaming of lubricating oils, pour point and viscosity index of lubricating oils, and lubricating oil additives. Extensive references are given including a detailed survey of patents on lubricant additives for 1948.

The Service Factor (Sinclair Refining Company) Vol. 16, 1951

LUBRICATING ENCLOSED AND OPEN GEARS.

Anon.—pp. 1-5

Topics considered include selecting the lubricant, lubricating system for enclosed gear sets, additives, draining, exposed lubricating systems and central lubricating systems. A chart shows general lubricating recommendations for various gear types, sizes, and speeds.

Scientific Lubrication, Vol. 3, No. 4, April, 1951

WE AGAIN EMPHASIZE NEED FOR LUBRICATION COURSES

Anon.—p. 9

The need for university courses on lubrication in England and other countries is stressed.

THE LUBRICATION LABORATORY OF MECHANICAL ENGINEERING RESEARCH ORGANIZATION

Barwell, F. T.—pp. 10-14, 30

The equipment of the laboratory is described. The research program is divided into five categories as follows: 1. Hydrodynamic Lubrication. 2. Boundary Lubrication. 3. Mixed Lubrication. 4. Causes and prevention of wear. 5. Performance and reliability of rolling bearings. Current projects are mentioned.

A NEW OIL REFINER FOR PRIVATE AND COMMERCIAL USE

Anon.—pp. 26, 27

The Lubex Oil Refiner, offered by Bromhead and Denison (London), is available in 5 to 350 gallon per day capacities. The oil is heated, treated with a polymerizing agent, the asphalt-like substances removed, and the oil filtered through an adsorbent known as Lubraffin (a special grade of Fullers Earth).

FIRST PRINCIPLES; DROP POINT OF GREASES

Anon.—p. 31

The drop point is the temperature at which a drop of grease first detaches itself from the main bulk, when the sample is steadily heated under controlled conditions. The method is described. It is noted that the American Dropping Test method (A. S. T. M. D566-42) differs somewhat.

(*See next page*)

THIS LUBRICANT SAVES GEARS AND TRANSMISSIONS

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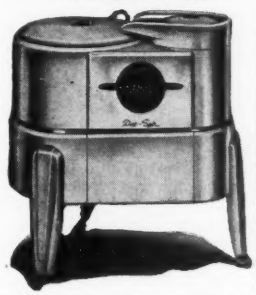

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No. 5, May, 1951

HYPERMATIC LUBRICANT—A COMPRESSIBLE GREASE FOR VALVE LUBRICATION

Anon.—pp. 20-21

A special lubricant at present is being manufactured by the Audley Engineering Co. Ltd., Newport, Shropshire, for the lubrication of their well known Audco valves. This is known as Hypermatic Lubricant and it has properties not hitherto associated with any other type of lubricant, solid or fluid. This new lubricant owes its special properties to the fact that it is compressible and the latent energy stored within it by such compression will do useful work by expanding automatically, and as necessary, to replace the lubricant used up during the normal course of valve operation. The lubricant is compressed in filling the valve and maintains this pressurized condition almost indefinitely. Less lubrication maintenance is needed. Hypermatic Lubricant has been used on Nordstrom valves in the U. S. A. since 1949, and has seen every type of field service. The makers describe this material as a "superstabilized" gas liquid emulsion with the gas providing the property of compressibility.

OIL TESTS REVEAL MAINTENANCE REQUIREMENTS

Flint, M. B.—pp. 10-13, 31

When lubrication control takes its place with other maintenance methods, it provides additional means for attaining the ultimate goal of satisfactory, economical performance and maximum service from the equipment. It further offers engineers an aid in extending the useful life of the oil while materially reducing the cost of major overhauls with loss of operating time. In this article, the author urges the greater use of on-the-job tests of lubricating oils by maintenance staffs themselves, who are capable of interpreting the results and utilizing them to forestall mechanical troubles.

THE UTILITY OF GREASES AT LOW TEMPERATURES

Anon.—pp. 25-26

Some valuable investigations have been carried out in Sweden in connection with testing the utility of lubricating greases at low temperatures. This work has been carried out by Driftingenior L. Raoul Niklasson, and the apparatus employed was constructed in collaboration with J. Bergstedt at SKF's Central Laboratory, Gothenburg. Final results were obtained at the Central Laboratory of the Royal Swedish Airforce, Malmslatt. The utility of greases at low temperatures are tested in principle, by a series of frictional measurements at different temperatures. Apparatus diagrams are shown.

THIRD WORLD PETROLEUM CONGRESS; BRIEF DETAILS OF LUBRICATION PAPERS

Anon.—p. 32

Section 6 is devoted to the Composition of Petroleum, Analysis and Testing, Measurement and Control. The development of tests for the evaluation of the performance of fuels and lubricants is an essential feature of modern petroleum technology. In this connection the octane number of gasolines, the cetane number of diesel fuels, and the various standardized engine tests for heavy duty lubricants are dealt with in several contributions. The methods used for analysis of used engine oils and oils for many other purposes such as lubrication of gears or for the enrichment of gas by carburetion, which are regularly subject to study and improvement, also come up for discussion. Section 7 (Utilization of oil products) will take up fuels and combustion, gas turbines and fuels, gasoline engines and fuels, diesel engines and fuels, protective layers and boundary lubrication, special lubricants, metal working lubricants, greases, additives, etc.

THE USE OF POLYGLYCOL STEARATES IN LUBRICANTS

Anon.—p. 26

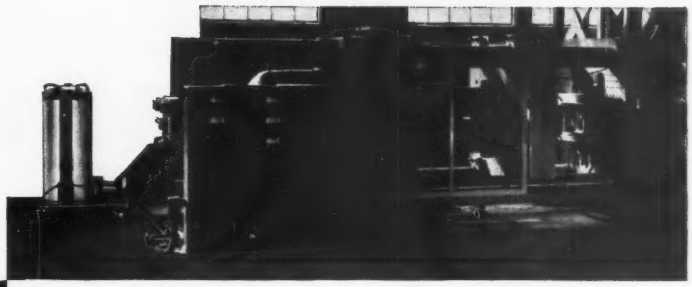
Some notes published by Croda Ltd., Snaith, Goole, Yorks, concerning the properties of their "Cithrol" brand of Polyethylene Glycol Mono-Stearates, includes mention of several uses in connection with lubricants. Polymerized ethylene glycol stearates, which are also described as hydroxy polyoxethylene stearates or polyoxethylene stearate and polyglycol stearates, are prepared either by the indirect action of ethylene oxide on stearic acid, or indirectly by esterification of stearic acid, with pre-formed hydroxy polyoxyethylene. Use in textile lubricants is discussed.

COOKING SALT AS A DRAWING COMPOUND

Anon.—p. 29

The work was instigated because certain "carrier" substances, such as lime, which can be used to increase adherence of lubricants to plain steel during drawing operations, are unsuitable for alloy steels and especially high-alloy stainless steel. Lead coatings have been used very

world's largest injection molding press



● This 69-ton, 300-ounce Watson-Stillman press accommodates dies up to 72" x 48". One of 14 injection molding machines at Amos Molded Plastics, Edinburg, Indiana, it employs a 7½-ton, 550 gallon hydraulic oil pumping unit (shown above being serviced by Honan-Crane Oil Purifier). Hydraulic equipment at Amos Plastics has been protected by Honan-Crane Purifiers since 1942.

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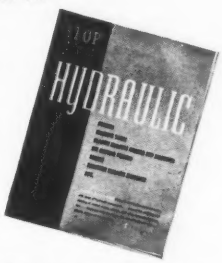

CIT-CON OIL ENGINEERING

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successfully for this purpose, but it was in 1949 that Wohak reported success with salt. The present work was undertaken by Lueg and Pomp. The effect of the salt coating varied with the angle of the die and the nature of the lubricant but results confirmed the utility of the method especially with stainless steel.

No. 6, June, 1951

"— BREAKDOWNS MUST BE ANTICIPATED AND PREVENTED."

Anon.—pp. 9-10

The editors stress the importance of correct lubrication.

WIRE ROPE LUBRICATION: PART I.

Anon.—pp. 11-15, 33

This is the first of three articles dealing with this subject. External lubrication of wire ropes acts as a preservative, preventing corrosion. Internal lubrication allows the individual strands to bend without subjecting themselves to excessive strains, thus preserving the principle characteristic of a wire rope, flexibility. Investigations into causes of rope fractures and deterioration are cited to prove this contention.

THE NEW CIT-CON LUBRICATING OIL REFINERY.

Hackler, M.—pp. 16-17, 20

At Cit-Con Oil Corporation's Lake Charles refinery four lube distillate streams from the vacuum tower are 100 distillate, 200 distillate, light intermediate distillate, and heavy intermediate distillate with short residuum, about 30 per cent of the reduced crude charge, off the botton. A furfural unit (30,000 barrels a day of solvent) extracts the 100 distillate, 200 distillate and light intermediate distillates.

A NEW RANGE OF MECHANICAL LUBRICATORS.

Anon.—pp. 22-24, 33

The article deseribes some of the locomotor lubricating equipment and diesel lubricators recently put out by Davies & Metcalfe Ltd. in agreement with Alex Friedmann of Vienna.

No. 7, July, 1951

COLD WORKING METAL LUBRICANTS.

Chishohm, S. F.—pp. 15-16

A symposium on "Metallurgical Aspects of the Cold Working of Non-Ferrous Metals and Alloys" was recently held in London by the Institute of Metals, and several of the papers presented dealt wholly or in part with the importance of lubricants in this work. A paper by S. F. Chishohm is summarized. Where reductions per pass are heavy and mill speeds high, the roll lubricant should have adequate film strength. The viscosity of oils increases with pressure, but this subject is being investigated in the extremely high-pressure range. Because rolling speeds are relatively low, cooling does not present a major problem. For cold-rolling of aluminum or its alloys to sheet gauge, light mineral oil (4-6 Centistrokes at 100 F.) is used with lubricity and film-strength additives, mechanical filtration will remove impurities. Press drawing, tube drawing, wire drawing, and residual lubricants are taken up. Residual lubricants may cause staining.

SELECTION OF OILS FOR INDUSTRIAL HYDRAULIC SYSTEMS.

Smith, A. C.—pp. 20-24, 26

The author considers: hydro-kinetic and hydro-static systems, suitable hydraulic media, compressibility of mineral hydraulic oils, solution and entrainment of air, oxidation stability, ability to prevent corrosion, effects on flexible materials, separation from water, general viscosity requirements, viscosity and pressure, viscosity index and pour point, selection of viscosity, and high viscosity oils not normally required.

THE GRAPHOID SURFACE—AN AID TO OILINESS.

Anon.—pp 25-26

The "oilness" of fatty acids is due mainly to their capacity to form metallic soaps on metal surfaces. If one puts a fatty acid on a non-reactive surface, such as chromium or platinum, it fails to show better results than a straight mineral oil, due to the inability of the acid to form a soap readily. The choice of a bearing alloy cannot be dictated wholly by its reaction to the lubricant. This has been recognized by the adoption of oil containing fatty acid, or compound oils, or the selection of highly reactive lubricants. In this way the poor response of a bearing alloy, such as a chrome iron, to a lubricant, is counterbalanced by the lubricant. Graphite forms a slippery surface. Also it will absorb oil more actively than

(*Concluded on page* 251)

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a metal. Two actions are involved in graphited oil: reduction in friction due to formation of the graphoid surface and stronger oil absorption by graphoid surface, enabling oil film to hold better at higher loads. Overall effect is shown by the curves in the diagram which results were obtained at high bearing loads. The concentrations of "dag" colloidal graphite in oil depends upon the application for which the graphited oil is required. For assembling mechanical equipment and Internal Combustion Engines relatively high percentage of "dag" colloidal graphite is incorporated in the oil, then applied to the working faces during assembly and may be added to the lubricating oil used during the running-in process.

DETERIORATION OF LUBRICATING OILS DURING SERVICE.

Priston, H. E.—p. 26

Before the Liverpool branch of the Incorporated Plant Engineers, the author outlined causes of lubricating oil deterioration: (a) the nature of the lubricant may be changed by chemical action such as oxidation or thermal decomposition and (b) the lubricant may become heavily decontaminated with water and adventituous matter such as combustion soot, etc. Oil must be "tailored" for the job. Steam turbine lubricants must possess resistance to oxidation and must separate readily from water, automotive oils must be stable and resist tendencies to sludge and carbonize, bearing oils for reciprocating marine steam engines must lubricate in the presence of water, etc. Oil must be changed regularly. Filtration and centrifuging may remove some of the water, soot, dust, unburnt fuel, etc.

Southern Power and Industry, Vol. 69, No. 5, May, 1951

LUBRICATING PRACTICES SIMPLIFIED THROUGH STANDARDIZATION

Jorgenson, B. H.—pp. 72-75

The more complexity, the greater the lubrication problem. Multiplicity of lubricants, obsolete equipment, brand names and simplification are taken up. Several years ago management at Tennessee Eastman Company, Kingsport, Tenn., was concerned with the excessive number of lubricants necessary. A committee of maintenance engineers of various divisions and departments of the plant was appointed to study this problem. The committee's functions included: simplification of lubrication practices and standardization, development of lubricant specifications, concerted action on lubrication problems. Testing new lubricants, dissemination of information, provision of specialists for solution of particular and specific plant lubrication problems, laboratory analysis, establishment of standard methods in the storage and handling, approval of equipment design to provide for effective lubrication.

No. 7, July, 1951

PRESCRIPTION LUBRICATION.

Copley, C. J. and Risk, W.—pp. 70, 72, 74

This Part XIX—"Prescribed Lubrication Practice"—is the concluding discussion in the extensive series of articles on industrial plant lubrication. Lower production costs and reduced maintenance expenses are related to the thin films of oil or grease used to separate the moving surfaces of industrial machinery. Getting the facts, organizing results based on facts shown by lubrication analysis, measure of the results, plan for future are considered.

MOTOR BEARINGS.

Anon.—p. 78

Count the number of conventional-type motors you have in your plant. Multiply that number by $4.52 and you have the average yearly cost of lubricating these motors plus the cost of motor failure caused by improper lubrication. That cost is based on a carefully conducted study of motor lubrication and outage costs due to bearing failure.

(*Continued from page* 239)

Advertising Manager: Howard Dingle, President of the Cleveland Worm and Gear Co., and its affiliate, The Farval Corporation, announces the appointment of D. H. Rowe as Advertising Manager.

Mr. Rowe served for several years with the Penton Publishing Co. as Associate Editor of the *New Equipment Digest.*

During World War II, he was a director of factory training for Jack & Heintz, Inc., and took an active part in the training of enlisted and civilian personnel. In addition to his training activities, Mr. Rowe also took an active part in the advertising department, where he supervised the preparation of technical data and aided in the preparation of trade show exhibits.

A native of Cleveland, Mr. Rowe graduated from Western Reserve University and attended Case Institute of Technology.

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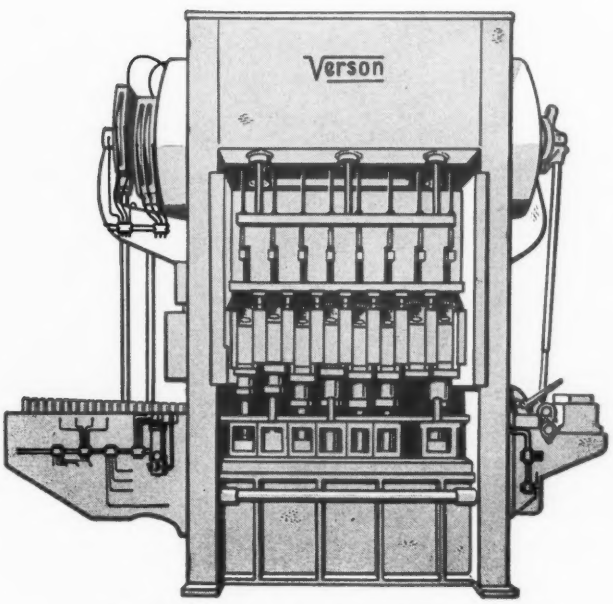

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For a full description of Farval, write for Bulletin 25. The Farval Corporation, 3267 East 80th Street, Cleveland 4, Ohio.

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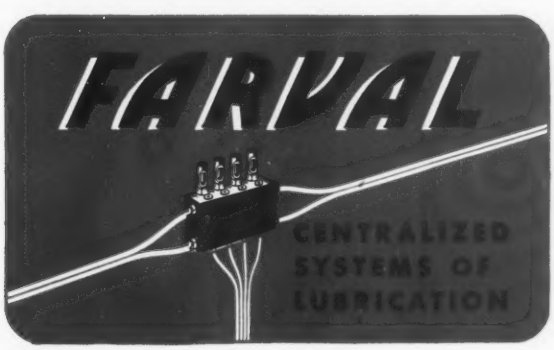

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